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ASSOCIATION OF IDEAS: A PRELIMINARY STUDY

A DISSERTATION SUBMITTED TO THE FACULTIES OF THE GRADUATE
SCHOOLS OF ARTS, LITERATURE, AND SCIENCE, IN CANDIDACY
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF PHILOSOPHY

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AMY ELIZA TANNER

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CHAPTER I.

INTRODUCTION.

In any discussion of consciousness there are always two assumptions that determine, to a large extent, the writer's point of view. Those are the assumptions as to the relation of mind to body, and as to the origin of consciousness and reflection. It is not, therefore, out of place to preface my detailed account of association with a statement of my position on these two points. Such a statement will both prevent misinterpretation, and will lead the more quickly to conviction if the theory is not consistent.

Take the relation of mind to body. We find a tendency in present writings to statements like this: "One image passes into another through a series of minute muscular and vascular changes." Protest must be entered against such a form of statement, because it so confuses different points of view. One brain state or general bodily state passes into another through such a series of changes, and this series can be registered with considerable accuracy. On the psychical side, one image passes into another through a series of transformations, which can also be traced introspectively with an accuracy increasing with practice. But the muscular changes are not the transitive images, although the sensations parallel with them may form the content of the transitive images; nor can they be said to cause those images, any more than they are caused by them.

We assume, rather, that mind and matter are the two aspects of activity which all experience assumes in reflection. During immediate experience there is no distinction between the two, and with reference to it it is possible to say that the interaction between them is complete. We express this psychologically by saying that consciousness is ideomotor; that is, there is in reality but one process—consciousness or experience. From this point of view, the statement quoted above has truth in it, but is misleading. The full statement would run somewhat like this: In passing from one experience to another, we go through a series with infinitely small differentia on both the mental and physical sides.

More explicitly, the confusion lies here: In the first place, in reflection, we take some standpoint according to which we wish to work, and when we abandon that standpoint, we do it because it does not give the results that we wanted. When we unconsciously change, we are illogical; and when we change consciously, we get a more generalized theory. Now, suppose we take the position of the physicist or physiologist. It is our object to state our experience completely in terms of matter. At some point in our explorations we run across the facts of mind. Four possibilities are open to us:

1. We may refuse to have anything to do with mind. We may say it is absolutely distinct from matter, so that any interaction between them is miraculous. Then, when we see such facts as those of hypnosis, we are forced to invoke a miracle in some form or other to explain them.

2. When these facts come before us, we may, on the contrary, assume that mind must be identical with matter, and that, when we have stated creation in terms of nervous, vascular, and muscular changes, the whole story is told. We become materialists.

3. Or we assume that matter is identical with mind, and give in our allegiance to the idealists. The difficulty with both of these positions is, of course, that, so far as their statements go, they ignore the fact that not only body acts on mind or mind on body, but that the reverse is true, and that they themselves have to admit it in practice.

Most modern physiology and psychology occupies the first position. It is outspokenly illogical and is trying to reach a more complete statement. Such a statement is the fourth possibility, and might be made in such terms as these:

4. There is but the one process of experience, but in order to get better control at definite points, it is necessary to abstract parts of this whole, and work with them alone. These abstractions form the material of the sciences, and in order to get the best results, they must be held as abstractions until the contradictions within each are so great that they demand a larger setting. The psychologist who is constantly invoking brain changes to explain his facts is dropping his own tools and thereby doing poorer work. He is not aiding his science in any way, for to assume such changes as an explanation does not give any control of the mind as long as we approach the facts from the mental side. It

will, unquestionably, give greater control from the bodily side, but in that case the facts belong to physiology, not to psychology. Much of what we call psychology today—all the work in which the attack on facts is begun by assuming that stimulus is the *cause* of sensation—takes just the materialistic position spoken of above, and is physiology, not psychology.

Psychology must, on the contrary, begin with the sensation, not with the stimulus, and must cling fast to changes in sensations, perceptions, and images in order to do its best work. Modern psychology is so filled with the other point of view that it has not begun to realize the mental control that may be obtained by a scientific introspection. It seems to prefer the cheap satisfaction of an apparent reasoning from physical cause to mental effect, to the close, careful observation of the changes in ideas and the laws to be deduced therefrom. But such observation is the chief tool of psychology in the proper sense of the term, and such observation may be made just as scientific, by carrying it on under the proper conditions, and has just as definite material to work upon in images, as any natural science.

On the other hand, in this article it is clearly recognized that the mental aspect is but one side or function of experience, and that for its origin and outcome we must refer to the other aspect; and it is also maintained that, from the standpoint of the science itself, such a procedure is not only justifiable but necessary, in order to give the subject a firm foundation. The discussion of the conditions under which consciousness arises is the discussion which the psychologist must reach when he has described consciousness, and this involves the relation of mind to body; but his end is to explain mental states, not bodily.

We find, naturally, well-worked-out theories of this relation of mind to body, corresponding to each of the views given above. The strict analogue of the first is that mind is a special creation, but physiology and psychology do not admit this, and usually are again inconsistent, and lapse into one or the other of the two next views.

On the materialistic basis mind is the result of stimulation, and all the higher processes of thought are obtained by compounding and recompounding the sensations obtained originally from external stimuli. On the idealistic, body and all other matter are the creation of

mind, which chooses thus to display itself. The objection to both theories is the one before mentioned, that each leaves out of view a large number of facts, or else is forced ultimately to taking the fourth position. In materialism, for example, the question constantly rises of why an organism reacts upon its surroundings and assimilates food, or, in general, what the impulse to self-preservation is. Now, it is manifestly absurd to say that it is the result of external stimulation; and the difficulty is not removed when we say intra-organic stimulation, because intra-organic stimuli are themselves changed by changes in the extra-organic stimuli. Idealism, on its side, gets into analogous difficulties.

Science, therefore, assumes a life-activity or self-preserving impulse as over against external stimuli or environment, and these assumptions become the fourth position, which is the one adopted here, when it is added that from the standpoint of reflective consciousness these two appear as inseparable aspects of one whole. Further, psychologically, consciousness is but one aspect of the life-process; it originated to satisfy the needs of the organism, and has developed in accordance with those needs. In its simplest form it is the general sensibility of the lowest animal life as manifested in contractility and irritability—the immediate and unimpeded response to stimuli, whether external or internal. In a more developed form it is reflective consciousness, which comes into the field when there is some obstacle to the immediate reaction of an organism to a stimulus, and disappears when the obstacle does. The stimulus may, of course, be either extra- or intra-organic, and the obstacle may be a physical opposition to our muscular reaction or the idea of another action.

Everyone can think of numerous illustrations. The acquirement of habits, the gradual transformation of a highly volitional and effortful act into an automatic one, is the most common example. Some tension between stimulus and reaction, something in the nature of inhibition, is indispensable for reflective consciousness, and the greater this is, the more vivid is the state of consciousness.

This balancing, considered as to form, is the image; as to function, is the mental process. We can best illustrate this by the rise of an image in the case of a reflex act, such as winking. When we see a ball flying towards us, we instinctively wink, or shut our eyes. We are

usually not conscious of the act until it is done, and we may not be even then if we are occupied in doing something else.

Now, suppose that a ball flies towards us and we do not wink. Some new factor has entered which makes the motor reaction go to a different set of muscles, and results in holding the eyes open instead of closing them. This factor will differ according to circumstances, but it can be shown in all cases to result in the development of an image as the central element. For instance, we may see that the ball will not hit us, and may will not to wink. This itself is, of course, a complex image-process, but is not relevant here. As an immediate result of my volition, or, perhaps, as the volition itself, we have in a flash a picture of ball-flying-towards-us-and-ourselves-not-winking, and then find our eyes fixed in a rigid stare in preparation for the coming ball.

That is, in general terms again, the lack of adjustment between different parts of the immediate experience results in the focusing of energy about those parts in the form of pain or friction, and in the projection of the uninterrupted activity as an end. When the ball flies at us, we wink the first time. The ball keeps on coming, and each successive wink in no way saves us from the next onset. Our present experience is being broken up, and some changes must be made. What these are in detail is a matter of no importance here, but whatever they are, they imply a direction of the activity by the actor, and that can only happen when the actor has an end.

In both these cases, and in all others, the essential thing to be noticed is this, that we select certain parts of our experience, and on their basis reconstruct our action. When we wink instinctively, we reconstruct our experience in that it is different after the wink, and we also reconstruct our action in that practice brings facility, but in both cases we take the experience immediately and react immediately. When we do not wink, we have the same stimulus, objectively considered as before, but its character is essentially changed by our recognition of other factors. These factors lead us to ignore the first stimulus in its immediacy, and hence we say we select the others. Strictly speaking, we see them all in different relations as a result of reflection, and the original stimulus to wink becomes part of the stimulus not to wink. Its connotation is different.

From the fact that the image is first developed when tension or strain comes in it must not be concluded that in the developed mental life the two can never be dissociated. In reverie or rest there is no conscious end or strain, and this is still more true of the images—frequently very vivid—of the last instants before sleep or the first after waking. Whether, theoretically, there is not some reference to an end is a question to be discussed later. At present it should simply be noted there are degrees in the definiteness of an end, and hence degrees of dissociation between the image and the reference to action.

Further, the ways of acting of consciousness are simply the kinds of adjustment most often demanded between organism and environment; and its content, shape, or form is always the result of the fusion of stimulus and reaction, is always put in terms of its origin and outcome. That is, every state of reflective consciousness is a unit whose component parts refer, on the one hand, to a previous unit in which they had their origin, and, on the other, to a coming one for which they exist. The state is a tension between certain stimuli and certain reactions, and always, therefore, takes the form of sensations on one side, and, on the other, of movements.

This form is the whole or complete image. A state of reflective consciousness is, then, a complete image made up of a great variety of conscious processes, consisting of image-transformations; and mental laws are the laws of these transformations, or of the use to which the images are put. All experience is a complex of images. When we perceive a house, the construction and recognition of the perception means the arousing and transformation of numerous images, which, when completed, form a totality that we call our percept of the house. When we carry on a train of reasoning, a variety of visual or motor forms arises before us. Some of them pass away at once; others expand, pass over into others, and these in turn change. Or we may have a series of word-images, accompanied by vague chest and visceral states, or by fleeting and indefinite motor and visual images, which only become distinct when we get into difficulty in our reasoning. In like manner, when we are going through the strain and stress of a moral decision, or are brought face to face with an unexpected and dreadful calamity, what we find in ourselves in their realization is always some image-complex. The focus of energy, or point at which

the tension is greatest, is the stimulus, and may be either a sensation or another image. Whichever it is, it modifies the whole form of consciousness, with the results known to us as the action of sensation upon the apperceptive mass, and as the effects of attention and habit upon the perception.

CLASSIFICATION.

Images may be considered statically or functionally, according as we look at them as distinct phases in the development of mind or as we examine the laws controlling their changes. Statically, they are the material of thought, the mind-stuff, and must be treated in a descriptive way as things. Functionally, they are the machinery of thought, its ways of acting, and the description of them must confine itself to them as a process. Statically, if thought is the activity, imagery is the determinant which limits, defines, and focuses its movement. Functionally this movement itself is only a continual change in the images.

Psychologically, therefore, it is necessary to consider images from both these standpoints, if we would appreciate their significance and know the mental life in its fullness and concreteness of detail. On the statical side, we must consider the origin of images, their forms, combinations, and so on; on the functional side, we must consider their movement, their interactions with each other, and the results of this interaction on the mental functions. We must observe in detail how, in its onward rush to a definite goal, the activity transforms or cuts off the image; how it abandons one form for another, and fills out the defects in one by others; how it controls the order of their going and will have naught of those which will not move towards its end. Statically, we must describe the constant defining of the activity as it goes through the arteries and capillaries of images; we must show how it is widened and enriched by the innumerable associations obtained in this branching out; we must draw in the colorings of emotion and thought which images provide. On both sides we must catch the transformations of process into product and of product into process. This is the really interesting and fruitful thing in psychology: *not* to grasp thought at its nodal or substantive points, but in its fugitive or transitive stages; to seize upon all the minute

changes through which it passes in any such series, and to state their law of transformation.

From this point of view we believe that a full description of imagery will throw a searchlight upon some historical philosophic problems. As psychologists, it is our business to analyze our mental process in deciding not to take a drink with the boys, or in yielding to the temptation. In either case we must observe exactly what images rise for and against the act, we must trace them back to their origin, and must describe the transformations of the one into the other, and the gradual absorption of one side. Here we stop. It is not our place to add: "*Haec fabula docet.*" That belongs to the moral or religious teacher. But we have told the story, and the conclusion as to whether or not the will is free must draw all its arguments from that story. So, also, if we are psychologists, when we are studying a geometry lesson we shall observe and describe what images rise in our minds at the mention of a triangle. Do we always get one image, and is it that marvelous thing which Locke describes as neither scalene nor obtuse nor equilateral nor right-angled, and yet as all of them at once? And if it is not this, how can it stand for all varieties, as it certainly does? All our concepts are the outcome of a long and complex image-transformation, and the basis of another equally complex process. It is our task to note what images they call up in us and to describe those images. We draw no conclusion as to their value as a basis for action. This task belongs to other sciences.

We make, therefore, a double differentiation of this work. As a study in psychology, it aims to describe (1) the material of mental activity, and (2) the transformations which take place in this material. As a study in imagery, it is differentiated from general psychology in that it attempts to get at the raw material of thought in distinction from the manufactured product. Thus, when we use the term "the concept horse," we are thinking of an index or sign which is indifferent as to its particular form; but when we speak of the imagery implied in the concept "horse," the expression at once becomes the resultant of numerous partly conflicting images with one common core, and our interest lies in finding how this resultant was reached.

On the statical side images are usually divided into sensory and motor; sensory images being those referred to a special sense-organ,

and motor those referred to the muscles. Sensory images then include visual, auditory, tactile, olfactory, and gustatory ; and the more prominent motor images are those of articulation and of the hand.

This distinction is sometimes also taken to mean another thing, viz., that the motor image is the active or constructive side of imagery, while the sensory image is the receptive or passive side. This idea is noticeable in a tendency to regard the visualizer as the contemplative type of mind and the motile as the impulsive, restless man of action, the inventor or creator. There do not seem to be sufficient facts to warrant anyone in making dogmatic assertions on this point as yet. Galton's questions among scientific men are not of much value as to this particular point, for while it is true that abstract thought tends to make imagery more and more abbreviated and symbolic, it does not therefore follow that those cues which are left must be motor, *i. e.*, images of movement. Theoretically they might quite as well be visual or auditory.

The real difficulty here is that the terms "sensory" and "motor" are used with two meanings. This comes out especially in the use of the term "motor." The first meaning is that which was given above. Here the image is defined solely from the side of its origin. The second meaning is that of James when he tells us that all consciousness is motor. Now, he certainly does not intend to say here that all our mental processes are put in terms of sensations derived from the muscles. As I take him, he means rather that the outcome or end of all mental processes is activity or motion of some kind—using "motion" in an extremely general sense. That is, he is defining consciousness in terms of its end. The actual process may be carried on in terms of either sensory or motor images, or both, but, in any case, the outcome is an act, and, in that sense, both classes of images are motor. For example, in making the reference to James, I want to get his book. I may go through widely varying processes as to content before I get it. I may have first a visual image of the book in the book-case, followed by a visual image of my hand grasping it, and the book open on the table before me ; or I may have the motor image of walking across the room, stretching out my arm, grasping the book, and fluttering its leaves ; or I may have a combination of the two. So far as the end is concerned, these are all equally motor ; they have led up

to an action; to speak popularly, they were all equally stimuli to action. Again, in reaching the conclusion that to say that we can know an immediate state of consciousness is a contradiction in terms, I may have a series of motor word-images or I may see it as a diagram. As a matter of fact, the two are usually combined. But in all these cases the images are motor in that they lead up to a certain reconstruction of my experience.

From this point of view we are induced to note that historically, *i. e.*, biologically, the special sense-organs and the nervous system were developed primarily as differentiations of action, because the more varied the actions of a cell were, the more likely it was to survive. To use a glittering generality, we might say that the eye, ear, and so on, are simply very highly developed muscles.

On the other hand, it is just as easy and just as true to say that all consciousness is sensory as that it is motor. When I think of getting James from my bookcase, what have I but a mass of sensations or memories of sensations? Every image expressed by such words as 'walking,' 'grasping,' 'brown,' 'open,' has a perfectly definite sensory quality, and there is nothing else to be found in the whole series of images. Or I have as my end a clear statement and solution of the contradiction in the use of the terms "sensory" and "motor;" but that end is only a union of a number of sensory images obtained from past experiences. It has perfectly definite sensory qualities which cannot be removed without removing it, and, as far as analysis can be carried, there seems to be nothing else. But, again, these sensory qualities have the very self-contradictory characteristic of ending in an act, and thereby committing suicide.

It seems to me that the solution here is the same essentially as that of the relation between mind and body. When we said just now that the sensory qualities end in an act, we changed our point of view. Sensory qualities, considered as such, never end in an act, but in other sensory qualities, and the transition from one sensation to another can be traced with entire definiteness of detail. On this side we can follow our sensations, perceptions, and images from the first vague feeling of tension, strain, and dissatisfaction, when we use or hear used the terms "sensory" and "motor," to the visualization of the relations between the two, the images of writing and the feelings of relaxation

and relief. Here there is no change from sensation to action, no transformation of receptivity into construction. There is simply a panorama of the mental life. But if, now, we simply translate all of the first scenes of the panorama into terms of the last, *i. e.*, put an end into the series, all is action, growth, evolution, and the sensational content of this or that phase is a mere carrier or medium for the onrushing life of the whole, and is likely to be looked on as a hindrance.

This distinction between origin and end is the same distinction as between statical and functional imagery. The division that we shall make, therefore, is :

1. *Statical imagery* — the content of thought or a description of the crystallized process.

a) *Images referred to the special sense-organs.* — These are gustatory, olfactory, tactile, auditory, and visual. All of these should be described in a complete account, but we shall consider here only visual images. Smell and taste images are of relatively little value in mental life, and tactile images are usually bound up with motor. Auditory images are of much more importance, but as my auditory images are (to be Irish) all motor, my account of them comes under the next head.

b) *Images referred to the muscles.* — The most important ones here are images of articulation and of hand and eye movements, *i. e.*, these are the most highly specialized and the most open to analysis. Probably the images of movements of all the other parts of the body are fully as important in furnishing the fringe of consciousness, but they do not usually come to the centre of attention. For the sake of brevity, we shall call this class of images "motor," but it must be constantly remembered that here the term connotes the origin of the image and not its function.

2. *Functional images* — a description of images in terms of function, *i. e.*, an account of mental processes in terms of imagery.

CHAPTER II.

VISUAL IMAGES.

By visual imagery is meant that form of imagery which is referred to the eye. When in memory we see the faces of our friends, we have visual images. When we think of the mountains or the sunset, most of

us have distinct pictures of the shadowed snow and valley, or of the gorgeous and delicate yellows, purples, pinks, and greens. Even landscapes which we have not seen are for most of us pictures and not mere words. When we are told that a friend's house is the second one from the corner of a certain street, and is gray stone with a southern exposure, we do not stop there. We have a more or less distinct visual image of a house of a certain shape and size, a certain distance back from the street, with a carefully kept lawn in front of it; and when we first hunt for the house and have forgotten its number, these additions of our own also determine to which house we go first. So, in general, when we carry on any mental process whatever as if we see what we are thinking of, the images are visual. It would not be necessary to emphasize the term "seeing," if Galton had not found that some of his subjects looked upon it as a figure of speech. The term is not figurative, but literal. We really see the absent scene, and concepts such as "horse" or "tiger," and even such abstract terms as "infinity," we may see in definite pictorial shapes.

In this department the first systematic work, and that which laid the basis for all future research, was Francis Galton's. He sent out a list of questions to a large number of scientific men, schoolboys and -girls, and men and women in the ordinary walks of life. In their first form the questions related to visual images, as to their illumination, definiteness, vividness, coloring, extent of field of view, and subject's control of the image. The object to be visualized was the breakfast table as seen by the subject on the morning of answering the questions.

Mr. Galton received a large number of replies, which he arranged according to degree in nine classes, the highest grade being the images equal to reality; the lowest, those where no visual image was discovered. In making the series, the standard for judging the vividness was the expressions used by the subjects themselves, combined with Mr. Galton's judgment. Many of the subjects used such terms as "perfectly clear," "equal to reality," and these are accepted without further investigation.

Anyone who has carried on investigations as to the correctness of people's self-observation will recognize at once the inaccuracy of such a standard. What one person would call equal to reality another would call only moderately clear; and the same person who says his

image is moderately clear might be compelled to call it dim, if the reality were put beside it. Further, in persons unskilled in introspection it is almost impossible to eliminate the factor of the influence of suggestion. In directing such work as visualization one is almost forced to give examples to show what one means, and this prevents the questions from being perfectly neutral in tone. I have noticed with interest, in classes of which I have been a member, how the classes would take the direction to which an intonation or word of the teacher pointed. Previous to it they would be all at sea—a fact which shows that the factor wanted was not a prominent one. After it, the number of introspective facts concerning it would be numerous and striking. This, of course, does not mean that the class was deceptive. It does mean that the relative prominence of the facts was overestimated by attention being focused upon them, *i. e.*, that they would not have the same function in actual mental work that would be concluded from the prominence given them in introspection. So such questions as those of Galton's are especially valuable for their gross results, not for their account of details. Even in the gross results there is one regrettable omission—no ratios are given of the proportions of very good, medium, and very poor visualizers.

In the first case—the comparison of the image with reality—it is a difficult matter to use correctives, and it is doubtful whether any can be found which can be applied to anyone unused to introspection, as most of Mr. Galton's subjects were. The test of identification will not suffice, for frequently a person is recognized when seen, although before then it is impossible to call up an image of him. It is also found that persons can match colors from memory who have no visual image of the colors. Neither is reproduction a satisfactory test of the vividness of the visual image alone, for it calls into play motor images and various associations which help out the visual image.

With *good* visualizers approximate tests might be made in some such way as this: Show something to the subject and have him visualize it as strongly as possible. When he has the most vivid image that he judges himself capable of producing, show him the object again and have him compare it with his image. By having the objects with slightly different illuminations and form, one might be found equal

to the image in the subject's judgment, and comparison of this with the original object would show the accuracy of the image.

I believe, however, that this can only be done with good visualizers. I have always supposed myself to be a medium visualizer, but when I tried this experiment it was absolutely impossible for me to make any comparison between my image and the actual color. The image was so far below the color that I felt that it was hopeless to think of ever reducing the color to its level. And yet, in my images, color is always remembered. On the other hand, the one with whom I tried the experiments is a good visualizer, and had no difficulty in comparing object and image. By simply putting a few thicknesses of tissue paper over the object, I reduced its illumination so that the subject judged the image equal to it. If, however, the experiment can succeed only with good visualizers, it would hardly be of general value.

Another way in which this result might be reached is by testing differences in the circulation of the eye, hand, etc., when there is an image of the object and when there is the object itself present. Practically, there is no¹ apparatus by which this can be done in the case of the eye, and in the case of the hand it is not accurate enough for such fine work.

We seem, accordingly, forced back to Galton's position of collecting and describing gross results, and this leads us to notice certain advantages of his method. The most obvious of these is that his subjects included large numbers of people of widely different mental training, as well as large numbers of about the same training. The two combined would, it seems to me, eliminate to a large extent the evils of suggestion so far as getting an idea of the medium visualizer is concerned. They cannot be relied upon for details of introspection or for extremes of good and bad visualization, but for the latter there are well-authenticated accounts. We shall therefore use Galton's statistics for the averages, and supplement him by facts from other sources.

Visual images are of all degrees of intensity. When at their highest in the healthy person they are comparable to reality, and they may go

¹ Since this has gone to press, it has been suggested to me that the ophthalmoscope might be successfully used in the case of the eye, instantaneous photographs being taken of the retina at successive instants.

farther and be confused with it, as in hallucinations and illusions. We all have had the experience, probably, of being in doubt as to whether we wrote a letter or only intended to write it, or as to whether we talked with a friend or only planned to talk with him. Taine quotes an instance of a portrait painter who was accustomed to paint at times from memory and at times from sittings, and who sometimes was uncertain afterwards which he had been doing. When the health is not quite up to its normal pitch, this tendency becomes more marked. When going to sleep, or when in the dark, we are especially subject to delusions. Faces rise about us, and fiery eyes glare at us. The traditional ghost becomes known to us, and burglars are constant destroyers of our peace. When we get a little more unstrung, shadowy forms flit about us. They may be animals, or spirits of the departed, or simply vague forms of we know not what. We catch a glimpse of them out of the corner of our eye as they pass us or slip out of the door; but if we turn quickly to see their faces, they are not there, and we know that they are illusions. They are always destroyed by a direct glance. If we go farther along this path, the images are not so coy. Although shadowy still, they will endure a direct look and then a stare. Finally they assume the visual characteristics of solidity. They press in upon us and force us to accept them as genuine companions as much as those whom we can grasp. Our world becomes peopled with animals, or with men and women who will not leave us by night or by day; and because we recognize their presence, men call us mad.

Our object, however, is to deal with the normal mind rather than the diseased, so that we shall not give any description of the gradations from sanity to insanity. In general, the law of this gradation is that the nearer the subject approaches insanity, the less he is able to control the image as a means to action or as a mediation of action.

In the normal person, also, images vary in distinctness. The phenomenal visualizer, Galton's highest grade, can recall scenes or persons in what seem to him the original brilliancy of coloring and definiteness and complexity of form. A sunset stands before him in all its glory of yellow, green, pink, and purple, with animal-shaped clouds catching the last rays of the sun as it sets behind the many-colored trees on the hill. A person met but once in college rises in his characteristic coloring, features, gesture, and dress. Such a visualizer

can add long columns of figures by looking at his image as most men do at their ledgers, and sometimes a case is reported where the only ledgers used are these mental ones. He can repeat page after page of literature by reading mentally the book in which he has once or twice read it. To this class also belong the chess-players who play several games of chess at once, blindfolded. They use the visual image of the board instead of the object, and turn from one image to another in the successive plays. Here also belong those painters, already spoken of, who paint from the image instead of from the object. It is not advisable to fill space here with mere descriptions which are already generally known, so we will refer the reader for further details particularly to Taine, "*On Intelligence*," and to Charcot, "*Les maladies du système nerveux*."

In many such cases as those cited the image goes beyond the reality in extent of details. While in reality the visualizer can only see at once one-half of a sphere or three sides of a cube, in his image he can see the whole of the outside of the sphere or the cube. Sometimes he can image at once two or three spheres inside of each other and see all sides of them all. This last is, however, very exceptional, and it is open to question whether there is not a swift transition and transformation of the image. Many people can see in images the landscape on all sides at once, or the whole of a room from the inside. Most visualizers can see in the image all that is in the direct line of vision, even though obstacles intervene in reality. For instance, imaging myself sitting in the library in my usual seat, I see the portion of the room in front of me, then through the partition, successively, recitation-room, stairs, etc., to the view of the athletic field obtainable from the end of the building. Or I can image myself above a house getting a view of the plan of the successive stories. In these cases no more is seen, apparently, than would really be seen if partitions were removed. In general, the relations between the extent of the field of view and definiteness of coloring and outline seem to have about the same ratio in the image as in perception. Galton gives no figures on this point, but, out of seventy cases that I obtained, thirty-eight, or 54 per cent., who were moderately good visualizers, judged themselves to have the same range of vision as in actual sight, and the colors and outlines of objects fairly distinct. Eleven, 16 per cent., have no coloring, or very indistinct,

the other factors being about like those of the first. Eleven have no distinct outline. Three can see more than in reality and have distinct outlines and coloring, and two get practically no visual image. Those who give these reports are college students, most of whom have had psychology and a little work in visualization. From this it would seem that in nearly all cases there is one factor almost the same as in perception, viz., the extent of the field of view; that coloring and outline are clearly less distinct than in perception, but hold in about 50 per cent. of the cases the same ratio to each other as in perception; and that in 32 per cent. of the cases either coloring or outline is almost nil.

In general, the average visualizer sees the image without difficulty, but does not run the least risk of objectifying it. He locates it variously. It may stand in front of him, where the object would normally; or at one side, so that he looks at it out of the corner of his eye, so to speak; or it may be on his eyelids, or even in his head. In some cases it is better seen with the eyes open; in others, with the eyes shut.

In no case do the details of the image, such as small differences of shading or minute changes in outline, stand out unless there has been, for some reason, especial attention paid to them in the perception. In many cases, where an object is usually of a certain color, or shape, it becomes so in the image, although it was not so in the perception. For instance, in the class from which the reports were taken a number spoke of the dark wood of the organ. The organ actually has an oak cover of nearly the same color as the chairs, which were always visualized correctly, but most organs are dark, and I believe there formerly was a dark one in the room described.

When visualization becomes more indistinct, the first thing to go is color. In such cases usually the person is not conscious of color in the image at all, but when his attention is called to it, it is dirty gray or dull brown or black and white. Sometimes the real color is known, but is remembered rather as a motor or auditory word-image than as a visual image. This does not mean necessarily that the person is insensitive to color, but it must mean, at least, that this sensitiveness is translated into other than visual terms.

The indefiniteness of visual outline, like color, is of all degrees. In some cases the image of furniture in a room, or the location of objects,

is represented purely schematically by dots or crosses, and in some cases it is impossible to visualize even these without the aid of distinct motor images. Such a motile can visualize, for instance, his mother's face, only he sees her as doing something, or can see a train only when it is in motion, or a geometrical figure only by imaging himself drawing it.

CHAPTER III.

MOTOR IMAGES.

On the assumption that all thought is carried on in terms of imagery, it would naturally follow that, when one kind of imagery is defective, another takes its place. Theoretically this may be any form. A person who becomes blind substitutes tactile images for visual; one who becomes deaf, visual for auditory; etc. One who has poor auditory images naturally helps out his memories of sounds, inflections, and pitch by motor and visual images of the rhythm and the movements of the larynx necessary to get a certain pitch. In listening to a piece of music that he wishes to remember, he makes movements of hands and feet and regulates his breathing to get the rhythm, and at the same time uses lips and larynx to get the pitch.

The class of compensations which has come most to my notice is, however, that in which the defective visual image is compensated by a motor, and hence I shall describe this in more detail. Further, it must be noted here that the pure visual or pure motor image, such as we have been speaking of, is an abstraction made for convenience of description and analysis. In actual mental life there is no pure visualizer. Each visual image has references to the muscles, which a very little analysis discloses, and doubtless further study would reveal references to the other special sense-organs. Even the best visualizer, for instance, must have some motor elements in his image in order to get the interpretation of its apparent size and distance. We tend usually to assume the attitude of a visual image of which we are thinking. If we visualize the Angelus, the bowed heads and clasped hands of the man and woman, besides the visual image of them, are represented to us by feelings in our own necks and hands, as if we were in that position. In visualizing any stationary thing, such as a house or a tree, there is always in the background also the image of moving the eye or body to

see the different parts of the object. In some persons this goes so far that there are distinct sensations of climbing. The assertion has been made that we estimate the height of a house or cliff by the amount of labor that we think would be necessary to climb to its top. In most people this is not true—the eye movements give us the estimate very largely—but it is evident that in either case the motor element enters.

The difference between the strong visualizer and the strong motile is, therefore, that in each case the other factor is relatively weak, not that it is lacking, and we should expect to find all kinds of combinations of the two. These combinations I have already illustrated in the simpler mental processes. In abstract thought or in volition the same truth holds. I find that in carrying on a train of reasoning I may start with a visual image. This is at once named, and I talk about it to myself, helping my words out at intervals by writing or diagrams. In other cases the word-image comes first. I get blocked and am forced to resort either to writing or to a visual image to straighten myself out. This functioning of the image will be described in detail later.

The most careful analysis of motor images is that given by Stricker in his two monographs, "*Die Sprachvorstellungen*" and "*Die Bewegungsvorstellungen*." The latter of these is devoted to an analysis of his images of moving objects. He finds that in all cases, both in remembering movements of his own body and of objects and in perception, the prominent factor is images, as if he himself were making the movements imaged. In the case of imaging moving objects, the sensations of helping to make the movements may be replaced or complemented by eye movements. In all cases the motor image may be bound up with visual or other images, but the latter factor is comparatively weak.

In my own case, the two factors seem to be so associated that suppressing one suppresses the other. If I image a friend coming across the campus, I cannot keep him moving without having both visual and motor images. If I try to suppress the visual image and still have the walking go on, the only result is a visual-motor image of myself, instead of my friend, walking. If, on the other hand, I suppress the motor images of legs, eyes, and body, my friend stands still, and I have the sensations of standing too. The close connection

between the two is shown again in some experiments I tried in transformation of motor images. I imaged in motor terms first my hand as pushing up on the under side of the table. But the image immediately spread into a motor-visual image of hand, body, and table in the positions necessary for the pushing up, and became a distinct visual image of the table flying up and the consequent loosening of the muscular tension. Again, I begin by imaging a bouncing ball, and the image at once spreads to include a motor-visual image of my hand making the movements necessary to bounce the ball. If I think of movement simply, movement in the abstract, I have at present the feeling of wind on my face rushing by me from left to right, and a visual image of it as a gray mass. I do not suppose that this image is a constant one, however, for I find my images of all abstract terms varying according to circumstances.

The motor images which have received the most careful analysis are those of speech. The writers on this subject have made the division into images accompanying (1) speaking, (2) listening, (3) reading, (4) writing, and (5) thinking in words. The most detailed analyses are those of Stricker in "*Die Sprachvorstellungen*," and of Dr. Raymond Dodge in "*Die motorische Wortvorstellungen*." Both writers are predominantly motor, and their images are those of speaking the words to themselves. Stricker finds in himself, however, that "for the understanding of a word a visual image of some sort is necessary. In thinking, the motor image may precede or follow the visual; in reading the order is: (1) the visual stimulation, (2) the motor image, (3) the visual image. He argues directly against the supposition of a direct connection between the visual stimulation and the visual image."¹

With Dr. Dodge, the motor-speech element is also the prominent one. The elements that have most influence upon the meaning of the word are (1) unlocalized auditory images and (2) visual images. His analysis of the various forms of language is as follows: In ordinary speaking aloud the series is: (1) the significant image, (2) the motor-speech image, (3) the muscular reaction, with indistinct auditory and visual images. In hearing speech the series is: (1) the auditory

¹ The fact that children learning to read tend to read out loud, would be an illustration of this, I think.

stimulus, (2) auditory image, (3) significant image, (4) speech. If the connection of the auditory image with the significant image is blocked, the discharge from the auditory image may be either to the visual image and thence to the motor-speech image; or directly to the motor-speech image. These cases happen in certain forms of aphasia in which the word is not understood.

In reading the order is: (1) visual image, (2) motor-speech image, (3) auditory image, (4) significant image. In reading aloud it then goes on to (5) motor-speech image again, and (6) muscular reaction. In writing there is (1) motor-speech image, (2) motor-hand image, (3) movement. Automatic writing also shows direct connection between the motor-hand image and visual image, the visual image and motor-speech image; and certain forms of aphasia show connections from the significant image to the motor-speech image, to the auditory image, to the significant image. In thinking, the series seems to be motor-speech images with usually no writing or visual images. It is just like speaking aloud, except that the auditory image is lacking. Bain also seems to consider thought in words as essentially motor; Egger, on the other hand, asserts that it is a pure sound-image, without any muscular elements in it.

It is to be noted here that while Stricker thinks that the meaning of a word is given in the visual image which it calls up, Dodge uses the term "*Bedeutungsvorstellungen*," or significant images. The elements which contribute to making this image are motor images with auditory and visual elements also.

In opposition to the significant image of both Stricker and Dodge, Stout maintains that the word can be understood immediately. He even goes farther and speaks of thought without images, at the same time ridiculing those who look upon mental processes as a magic-lantern show or picture gallery. He leaves us in doubt, however, as to what this pure ideational process is, so far as any explicit description of it is concerned. The examples which he gives as illustrating his thought best are those from ordinary conversation, especially sentences or words expressing abstract ideas. Here he believes that we understand the meaning without any image whatever. Ordinary discussion or writing does, indeed, disclose no image to the casual observer, and it seems as if our knowledge of the meaning of "understanding" or

of "in war the weaker have always recourse to conquest" is independent of any image, and as if the image, when present, were called up with difficulty and by second thought.

Now, Mr. Stout assumes two things: (1) that we all know what is meant by "understanding the meaning of a word," and (2) that an image is "derived from, and in some degree resembles in quality, the sensations of the special senses," whereas, he says, thought cannot be referred to any such origin. If Mr. Stout takes the position that mind is somehow put into the body from without, we cannot argue with him here, for that is a metaphysical discussion. But if he takes the standpoint of evolutionary psychology, it is hard to see how he can escape the acceptance of the theory that mental processes have been developed as a means of better adjusting the organism to the environment, and are therefore sensory and motor as to origin and end. In that case no thought-process can come into existence which does not consist of the consciousness of sensational or motor elements, immediate or mediate. Furthermore, if the end of every thought-process is ultimately an adaptation of the organism, this must also be the end in the use of language, and the meaning of a word must consist, ultimately and originally, in the representation of some such adaptation. This representation is the image.

Mr. Stout's statement, that in ordinary language no image emerges, is true in this sense, that the reaction or adaptation to the word itself has become habitual, and hence the image drops out as it does in all habitual acts. But in the case of a new word, or an old word with new connotations, see how quickly other images than words rise! When, for example, we speak of four-dimensional space, the mind at once sets to work to construct an image. Take, further, the case of abstract terms, of which Burke makes so much in Mr. Stout's quotation of him. Burke asks whether anyone has images of such words as "virtue," "liberty," and "honor," and Mr. Stout reiterates it. Does, indeed, anyone understand them unless he has images of them, or of the appropriate reactions to them? Much discussion is fruitless just because those arguing use only the word and not the image which gives its meaning.

Again, Mr. Stout assumes that it is impossible to have an image of a series of transitions, or of a schema or plan or "total impression," but

I cannot find that he tells us positively how we can have an apprehension of such things. He speaks of a "forward and backward reference," an "apprehension of the whole without an appreciation of its details," and looks upon it as axiomatic that these must be imageless. As a matter of fact, these feelings of reference consist of undefined motor and visual images. In thinking of a schema, often a visual outline comes before the mind and is apprehended as one, just as in actual vision a table is apprehended as one object. Indeed, it might be said that the education which at length enables us to grasp objects in space as one and distinct is also the education in grasping the image in the same way. The forward and backward movement to take in a schema as a whole is essentially the same as in perceiving.

My main contention with Mr. Stout is that he limits too much the term "image." It is properly applied to any state of consciousness that is stimulated from the central nervous organs.

The imagery of music belongs, in the main, under auditory images. Baldwin, in his first book on "Mental Development," summarizes the pros and cons of the argument very effectively, and I will not repeat him here. My own imagery in music is so little auditory, and so largely motor and visual, that a description of it properly belongs here. In the first place, I should state that my discrimination of pitch differences, according to laboratory tests, is about average, perhaps slightly below the average, and that I have almost no ability in recognizing absolute pitch.

When I stop attending to other things, I usually find some tune running in my head. As Baldwin says, this is sometimes suggested by recently hearing it; at other times the rhythm of my walking or gymnastic exercise brings up the rhythm of a familiar tune. In this case the tune may also react and regulate the walking or the exercise. At other times the tune seems to go with my breathing. Now, there seems to be very little of the true auditory element in these tunes. I sing or hum them to myself, and if I suppress the larynx movements I suppress the tune. If I sing one tune and try to recall another, I cannot get the second at all, if the time and pitch are markedly different from the first. If I take two songs that are familiar and are of the same time and pitch, I can, by vibration of the attention, do both. If I recite a piece and think of a song, the result is the same: I can sing

the piece or alternate with the song. After singing out loud vigorously the first line of the song, I can recall it while I speak the piece, but I am inclined to think that this auditory memory is but the after-image. It soon dies out, and I cannot renew it.

I can best describe these images of music by a detailed account of a piece which I formerly played and knew by heart, Beethoven's "Sonata, Op. 14, No. 2." The description was written the day after playing it.

Images :

1. *Visual*.—I see distinctly the size of the page, the blackness of the notes, and the opening notes ; indistinctly, the heading, the number of sharps, and the marks of expression. I have also another image of the page as it is in my own copy of Beethoven, and indistinct images of myself playing, of the room filled with sunshine, of the girls present, etc.

2. *Motor and tactual* :

a) In my hands : Feelings of stretching and contracting, raising and lowering, stroking and tapping, the same movements for each finger as in reality. These are accompanied by an uneasy, sore feeling when my thumb or first finger ought to be used. These images become more indistinct as I go on to parts that I cannot play without the notes, and finally are reduced to a successive tapping of the fingers without regard for which finger belongs to each note.

b) In my throat : I say the names of the keys to myself and go through the varying movements of the larynx for different pitches, volumes, etc. It makes no difference whether the music is harmony, or simply melody, my throat is equal to both of them, when helped out by the other images described. I have watched myself carefully in this respect, and I think I am not mistaken in saying that the auditory image is very weak, if there at all. I am not sure that I know what an auditory image is like, for if I suppress the various motor images, there is no imagery left of the music, and yet, when I allow them to develop, there seems to be a kind of hearing of the music also. I find it very hard to describe what I mean. I seem to hear the music in my throat, if there is any meaning discernible in such a statement ; that is, I seem to have no auditory images referable to the ear as my visual are to the eye, and yet I have perfectly distinct images of the

pitch, timbre, etc., of a piece which I know. The images of the "Bridal Chorus" from "Lohengrin" are totally different when I image it as sung by a large chorus and as played by a full orchestra, but in neither case do I seem to hear it, in any ordinary sense of the term. Aside from differences in the visual and motor images called up by the two representations, there is a great difference in the diffusiveness of the imagery. In the case of the orchestra, the drums and cymbals clash in my chest and my whole body seems to vibrate, while in the chorus these general images are much less prominent, although they exist. Instrumental music of any kind affects me more than vocal because it spreads, or rather surrounds itself with so many more of these general images.

In the case of music that I have heard only once or twice, and that is more than a simple melody, after a day or two, all that I hold of it is these general images—what James calls the emotional feel. I know that it affected me in a certain way, and I have feelings in my chest of the rhythm, if it is marked. Exceptionally, I hold a strain so that I can reproduce it in my mind. The result of this is that I sometimes say that I like a piece, and yet I do not recognize it when it is played.

As bearing on this point of auditory images, I should say that I do not play by ear at all, and have to pick out on the piano with much labor the simplest piece which I have never learned from the printed page. When, also, I have partly forgotten a piece, it is useless for me to try to recall how it sounds. The most efficient way is for me continually to play over what I do know, as thus the motor associations necessary for the remaining movements may be aroused.

From this account of motor images it will be seen that they are very closely connected with touch-images, and the same is true of sensory images. One of the invariable elements in either memory or imagination is a consciousness of one's own location, and that consciousness is a combination of tactile and motor images. I am inclined to believe also that touch-images combined with vague motor images constitute the emotional attitude, while the intellectual attitude consists of sharply defined images.

TOUCH-IMAGES.

My touch-images, considered alone, are distinct. The feeling of an object is one of the constituent parts of my image, and in many cases is the cause of my liking or disliking it. This is especially true of fabrics. When I think of velvet I have the "cold shivers" called up by the touch-image, and not all my appreciation of the beauty of the fabric can overcome this shrinking from it. On the other hand, beaver or sealskin calls up all sorts of pleasant touch-images so strongly that there is a kind of voluptuous delight in the mere thinking of them.

Besides these definite images there are, as noted above, numberless vague combinations of touch and motor states of consciousness which constitute the background of our thought, and give its emotional setting. The difficulty in describing these is very great, not only because they are hard to catch, but also because language is primarily intellectual, and so, when an emotional state is described, it is likely to stand out with a sharpness and hardness that it never actually possessed.

I confess myself entirely inadequate to the task with my present powers of introspection and language, and I shall leave this chapter until a later time and pass on now to my second main division — "Imagery in Association."

CHAPTER IV.

METHOD.

From what has been said so far it appears that the material with which we have to work consists chiefly of visual and motor images which are reciprocal in action. The problem now before us is to follow the shaping of these images and to discover, if possible, the different uses made of them in these different processes. We cannot admit for an instant what Mr. Stout maintains — that thought can be carried on without images, and the refutation of his statement must consist in such a description of the mechanism of the mental processes as to show that an image is always present, and that one and the same image may be used for different processes.

At the outset it was necessary to find some means of watching and catching thought-processes as distinct from thought-products. Here

the point of interest is not the image as visual or motor, but the visual or motor image as narrowing or growing according to some law, as meaning something, as functioning.

But to get the image as functioning, *i. e.*, to get a normal thought-process, brings up all the difficulties of introspection. Is the thought-process normal when we are watching it? Is not the very watching a strong modifying element in the process? Judging from the various writings on the subject, there must be either many ways of introspection or else defective observation of the process. I hesitate to add confusion to confusion, but an account of my method is essential for judging the validity of my results.

In introspection I have found the attitude to be essentially this: one sets about some interesting piece of work with the intention of getting all the steps of thought. This means two things: (1) that one sets one's mind to stop after a short interval, just as one sets it when he wants to wake up at a certain time; (2) that attention is intensely focused in the thinking. I am not at all prepared to say what this set of the mind is psychologically. The whole process seems to be something like this: the thought-process goes on until a certain number of images have accumulated, and then becomes a process of reflection and recollection of those images. The number decreases as skill in recalling the details becomes greater, and the images stand out in constantly increasing clearness of outline. With practice, the stoppage of the thought and reflection upon it becomes almost reflex, so that the attention is less and less scattered, and yet at any stage there is the same tendency to distraction of attention as there is in carrying out any very complex act. I find always a tendency either to go on with the work regardless of introspection, or to make the center of attention the introspection of the fleeting images of habitual associations. Exactly the same kind of thing occurs in any new act, as learning to ride a wheel. As we all know, the difficulty is that there are so many things to attend to, and we cannot disperse our consciousness over them all at once. We have to be supported while attention focuses itself on teaching us how to keep the pedals and make the wheel go round, until that act becomes habitual; then attention is focused upon the balancing of the body, and so on. The net outcome is that there is a heightened consciousness of all parts of the body to

certain stimuli, combined with new habits of reaction. In one sense attention is more divided than before—it is more easily distracted to comparatively slight stimuli. The fact is better expressed, however, by saying that attention, as it becomes more complex, becomes more plastic.

Now, I would submit that introspection is just one example of this fact, and not a thing by itself, as is so often claimed. In learning to introspect, one cultivates a sensitiveness to all sensations and images, and the skilled introspectionist is the one most sensitive.¹ As regards division of attention, then, introspection is in no worse case than any process of observation.

Another difficulty is, however, that the process of advance, stoppage, and description, and advance again, is different from the normal one of uninterrupted advance. The question arises at once as to what guarantee there is that such an interrupted process is governed by the same laws as the normal one. Can we be said really to reason and judge when the end which we set up for reasoning and judging is subordinated to the end of introspection?

It is, of course, true that the whole process, including introspection, differs from the usual one. The difference might be represented thus :



But there is no reason why, in the latter case, the process which is the subject of reflection should not be controlled by the same laws as in the former, if the nature of introspection is as just described. During the process of reasoning there is an end set before the mind, just as in the usual case; after it is completed, on account of the training in alertness previously received, the reflection upon the process can be carried on with much detail. Most introspection, however, has consisted in letting the mind loose and watching what it does. The result has been much good description of habitual associations, but scarcely any of ordered thought. The latter is just the process which is of most

¹ The power of description is, of course, also necessary to make this sensitiveness available to others.

practical use, and so introspection has a bad reputation among "men of good common sense." But, theoretically, it is not the method which is at fault, but the facts to which it has been applied, and the lack of skill in those conducting the work.

To obtain the necessary skill, I adopted the same methods that are used in the psychological laboratories. In the first place, for a period of six months, I put myself through a series of mental gymnastics in observing image-transformation, in order to eliminate the effects of newness. In the second place, I framed my preliminary hypothesis in the most general way possible, and held my mind to an intense wide-awakeness to everything that was going on, in order not to bias the series of images by focusing my attention on a definite end at the start. Furthermore, the disastrous effects of such attention can be counter-balanced by comparing the results in one case with those in another where the attention was on a different part of the process. Something like a true estimate of the relative prominence of the various factors may thus be obtained.

To get a material which should both furnish an interesting end and should involve all the mental processes, I decided to write out a summary of various subjects of the high-school curriculum which I finished ten years ago. The fact that I had forgotten large portions and remembered others only imperfectly, while still others were suggested by things around me, seemed to give ample chance for reasoning, association, perception, etc., while the desire to get a complete, systematic summary would guide the whole task. I wrote out these summaries in the case of the subjects which I have studied very little since, viz., physics, algebra, Virgil, and physical geography. I then went over the material with a view to finding the law of association.

I feel sure that I have avoided the greatest difficulty in introspection by thus getting my raw material of images before me in an objective form before I formulated any theory about it. In the introspection my attention was given wholly to the task of taking in as much as possible of the object of thought. My mind was in a state of the highest tension to vibrate to its stimuli in proportion to their intensity. It was fatiguing work, of course, and I could not hold myself to it more than an hour or an hour and a half at a time. Some days I could not do it at all, and so of necessity it took a long period of time to get

the material that I have. I wish to emphasize again the great defect in most introspection, viz., that of observing the mind with the view of proving a certain theory. Almost any theory can be proved under such conditions. Again and again, as I have been formulating my ideas, I have referred to myself and have always found the facts that I wanted. It is needless to say that I have not used them. The direction of attention to certain ideas must make those ideas prominent. Facts so obtained lead to a false psychology. On my plan, on the other hand, it seems to me that we have a basis for generalizing about the laws that govern that mind, and by comparing this with other minds we may safely conclude as to all minds. This comparison I have not as yet been able to carry out in any detail. I consider the theory, therefore, as merely a working hypothesis. Doubtless it contains features that are unessential, and that I myself shall eliminate as my observation widens. I took this material, then, and some that I obtained during the same time from purposeless trains of thought, and went over them to ascertain what common principles there were. I finally formulated my theory as given below.

CHAPTER V.

ASSOCIATION.

A word is necessary first as to presuppositions. I have assumed as the actor in my drama a living organism, and on the conscious side that means, to my mind, at least three things: (1) a general correspondence between pleasure-feeling and stimuli beneficial to the organism, and pain-feeling and stimuli harmful; (2) the law of habit, or what Baldwin calls organic memory; (3) persistence towards pleasurable and from painful stimuli, *i. e.*, the "impulse to self-preservation."

The statement of the laws of association, dissociation, and attention is the statement of the order of development of the mind and of the modes of transformation of images. The thesis may be thus worded:

1. Whenever a unified activity is interrupted,

a) It at once becomes projected in its original form as a desired end, and the tension between the two factors becomes the adaptation of means to that end.

b) Within this tension sub-tensions, and hence sub-adaptations and ends, rise almost *ad infinitum*, modifying and defining the first projected end, which, in turn, holds them together within certain limits as in a mold.

c) The process of attention, or the formation of new dissociated associations, is this interaction, and depends, therefore, wholly upon the relative prominence of various ends and the degrees to which reactions to them have become habitual.

2. The stock of static images in any mind is the residuum of past ends, and the habitual associations and dissociations between them are the reactions which have been serviceable in the past, with the end to which they served now lost to consciousness. The associations and dissociations are graded according to the mental development, from the first vague and indiscriminate associations in which dissociation is hardly visible, to the definite, dissociated associations necessary to reach our present end.

In mental life as in physical, the animal which responds most effectually to stimuli is the one which survives. In the first place this response must of necessity be vague, because there is no experience to guide it, and therefore the animal which could respond most forcibly in all directions possessed an advantage over others. Throughout all growth this condition of things exists to a certain degree when the animal is put into new surroundings, and hence the habit of indiscriminate association was the earliest developed and one of the most constantly used. It is quite as valuable in the life of any growing person today as it was when mental life originated. To the scientist, for instance, the possibility of holding every unimportant fact to which attention is not directed is of inestimable value, because frequently, in reflection, those facts turn out to be the really vital things. To the painter the ability to reproduce the ensemble of a color scheme is one of the most important factors in his art, and this rests upon just the tendency to indiscriminate association. In general, all that goes to make up our sense of atmosphere, mental or moral, is due to this mode of mental reaction. The hasty generalizer, the dogmatist in all his disguises, is the man who has not the habit of total reaction. Of course, many cases can be cited where the habit is of no perceptible value now. Associations of contiguity, which are but another name for

this, are not held in high esteem by modern psychology, and, in view of the more complex forms of association, such an opinion is entirely justifiable. It is of no importance, apparently, for us to remember which side of a page a certain sentence is on, or what store we stopped in front of when we spoke to our friend. At the same time, it must be remembered that such a habit is justified by race experience, and that we never can foresee when it will be useful again. In proportion as definite lines of reaction become established—as is illustrated by instincts¹—this habit drops out, but it is always in evidence, and probably always will be at the growing point, the point where we are having a new experience.

This comes out most clearly in cases of strong emotion. In great sorrow or great physical pain unessentials and essentials seem to have the same vividness in our memory. The cake that we had for supper the night that we heard of the death of a friend is as present to our imagination as the face of the friend or the horror of the pistol shot that killed him. The surgeon who performs the operation, the instruments, and even the song floating up from the street, and the white crispness of the nurse's dress, are all part of the pain, and are all shunned until separated from it by reflection and experience. So, too, in opposite experiences. We all have a silly fondness for the place where great joy has come to us. We can hardly imagine that the momentous avowal could have been made anywhere else. The wedding dress and flowers are kept as if happiness dwelt in them, and a certain color carries within itself the soul of our love and longing.

All such experiences are strictly comparable to the baby's "blossoming, buzzing confusion," and, like it, they tend ever to disintegration. We do separate the physician from the pain, the dress and place from our happiness, as repeated experiences show us that they are not essential factors. Yet, at the growing point, the power of such reaction is valuable, and hence it is preserved.

¹ I do not mean to imply here that acquired characteristics can be transmitted. As between the Lamarckian and Weissmannian theories I do not feel competent to judge. Whether evolution has proceeded by means of natural selection which has selected acquired individual characteristics for transmission, or inborn, the outcome is that beneficial traits have, in the long run, been secured, and that is the only important point here.

1. *a*) At the same time, there is an immense waste of energy in this habit. The end is secured, but at an undue expenditure. If, therefore, any animal could react in a more limited way while still retaining the ability for the wider reaction, the whole tendency would be to favor such a development. The possibility of this limitation is given even in the first stages of mental life, when any such indiscriminate reaction is interrupted by a stimulus, and when, therefore, it is urged into a new channel. This change cannot be made all at once. There is a stage in which part of the energy continues in the old reaction, while part is impelled towards a new. Now, that particular reaction which can be most easily transferred to the new stimulus will be that one which is unessential to the old, because the tendency is to continue the old activity. Any change, therefore, in the sensations from it will be resisted, and the attempted reaction will be forced to another point. At this point a change in the reaction will also cause a change in the sensations from the old activity, but here the pain of change is less than the relief obtained from the cessation of the new stimulus, while in the first case it was greater. Further, the organism now gets sensations from the old activity minus some of its unessentials, and also from the new activity. The result is a narrowing of the old activity's path. Repetition of such experiences and of the resultant benefits leads to the habit of increasing conscious activity at the point of stimulation, that is, at the point of strain, and the feelings of pain or tension at the interruption of the old activity lead to the objectifying of its continuance as a desirable end.

This whole statement may be illustrated by an example from adult life. I am reading, that is, getting the visual stimuli from the book and interpreting them; but at the same time I am getting visual and auditory stimuli from a flapping curtain. The instinctive thing is, first, that my eye attempts to accommodate itself to the varying light and also to continue the reading, and it succeeds for a time. But I now have the sensations of varying light to interpret as well as those from the print, and yet I cannot fit them into each other, for while the print calls on me to continue reading, the flicker calls on me to stop. The tension in trying to accommodate to both finally becomes painful enough, so that I try to stop accommodation for the flicker by going at the reading more intently; *i. e.*, I try to shut out the new stimulus.

Perhaps I succeed. But it may be that the flicker is pronounced enough to demand direct adaptation to it. In that case I finally have to adapt myself to it, and admit a new end by stopping my reading and fastening the curtain. The end as such appears here as really my explanation of my adaptation, an objectifying of my sensations, and at first is not separated from my sensations. At first, that is to say, I go through a series of habitual adaptations for such stimuli, taking the stimuli merely as signs for the reactions. But the very fact that the reaction does not dispose of the stimuli forces their content into prominence on the one side, and the content of the reaction into prominence on the other.

b) The sub-adaptations also appear here. The interruption to my reading makes the reading my definite end, and accommodation to the light-stimuli the means. But the conflicting stimulus from the curtain diverts some of the reaction to the print, so that the two cannot be carried on together, and its cessation becomes a defined end, which is at once carried out by my walking over and fastening the curtain. The old activity can then go on, but it has a fuller content in my increased consciousness of the part that quiet and regular light play in it.

c) What we call voluntary attention enters, accordingly, in this sub-adaptation, with constant reference to the larger and at first more indefinite end. We start with some image which is to be realized, and in the course of realization we are constantly admitting new images which seem to fit in with the old, and rejecting those which do not. From the nature of the case, the dissociative side will not be as present to consciousness as the other, but still it comes out somewhat. The end which is reached is also different from the one with which we started, or, if it is the same, the sense of strain in reaching it is greatly increased. Where the end is pretty clearly defined, very striking cases of associations of similarity may be obtained, as in the following series. These were obtained from a class of Professor Dewey's. The object was to end with the same image as was begun with.

I.

1. A dark ocean wave with a light fringe of white spray.
2. A dark silk scarf with a ruffle of fine white lace.

3. A plant, *Spiralia*, with thick foliage of dark-green leaves and fine white flowers which grow in tufts at the top of each stalk.

4. An open milkweed pod overflowing with its fine white silken contents.

5. A blooming field of buckwheat.

6. A dark cloud with a white, sunlit edge.

7. A dark cloud of smoke with a white edge.

8. The original ocean wave.

II.

1. Hands of a clock.

2. A balance.

3. A compass.

4. A pair of dividers opening and closing.

5. A part of the machinery of a ship that looks like jaws opening and closing.

6. Jaws of an alligator.

7. Ferris wheel.

8. An eye.

9. Clock-hands again.

III.

1. A peacock feather. This stands wavering before me until the feather fronds elongate, turn out and over, and I have

2. A weeping willow. Almost immediately the color changes, and I see what I first call a cauliflower cut down the middle, but upon close examination recognize as one of the drawings of the cochlea (Fig. 20) in James's "Briefer Course."

3. Here I think of the peacock again and get a large, beautiful elm, the shape being the prominent part.

4. I keep referring from the elm to the feather, and, after some suspense, the elm elongates, the branches straighten, and the peacock feather's eye appears at the top.

The series of pictures are taken exactly as given by the student. The following explanations are also his, but are not verbatim: Rev. George Henslowe is cited by Galton as imaging a cross-bow and attempting to go through a series of images back to his own original cross-bow. I tried it and obtained a result that is rather peculiar.

The first trouble was that there was an arrow added to the bow, so that after the arrow left the bow my images followed the arrow, and after a while began to turn towards the bow. Following the series of images, we can easily tell where the change began.

It is exceedingly hard to take note of the images as I go along. Any effort to take a mental note, however slight, reminds me at once of the original object, and is apt to cause somewhat abrupt changes. The transition from 8 to 9 and 10 was such. There are two ways of reminding myself of the final object: (1) I can leave the present image in suspension and turn to the original picture, and then return to the image before me. I must not prolong the time, for that would change the present image. In general, this is not very hard, but when I return to the last image, it has already undergone some change. (2) Or I do not turn aside any farther than to bring it into vague consciousness. This also is enough to effect a change, so that I cannot say how much my will interferes in the process. There seems to be a vague remembrance of the original cross-bow in its outlines somewhere, and the effort somewhere to conform to that. What I am conscious of is the images and the gradual changes that bring them nearer and nearer to the original image.

EXPLANATION OF THE SERIES.

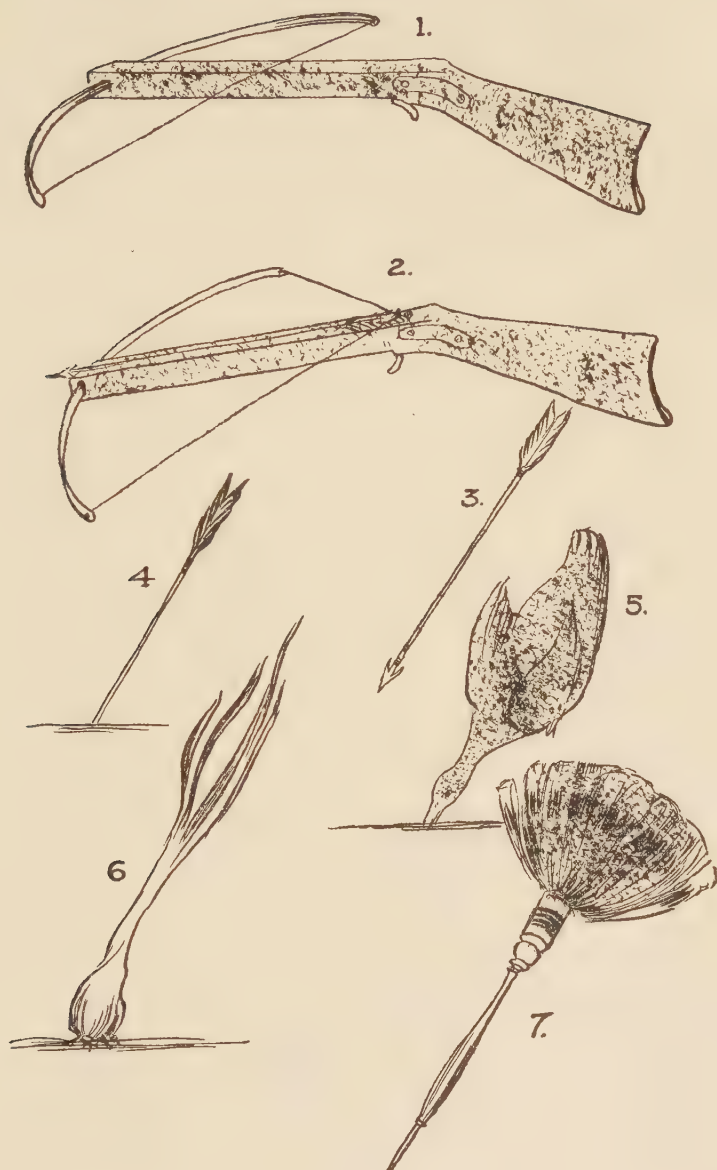
The images all had distinct colors.

1. The image was voluntarily called. The pattern was nearly as in the sketch. But I must add that oftentimes my images are only partly visible. *E. g.*, the lock in this case was added, so to say, on second thought, after the second image was completed.

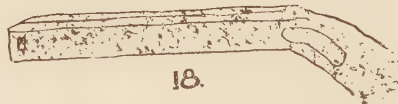
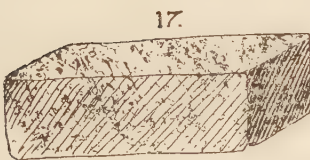
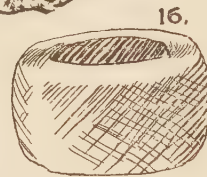
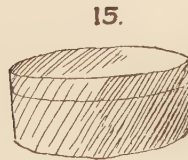
2. The appearance of an arrow was very ready; the adjustment of it on the bow and the movements preparatory for shooting were clearly seen, and were accompanied by muscular sensations of arm and shoulder. I forgot to take note of who did the shooting. It must have been myself, for the sensations in the fingers, arms (especially the right), and the shoulder were very vivid. Whoever it was, I saw only the arms and fingers.

3. The figure above shows the position of the arrow just before dropping on the ground. I followed the flight of the arrow, which caused muscular sensations of the eyes and produced some effect on my breathing. The shaft is yellowish and the point gray steel.

Series I.



Series I.



4. The back garden of my home, with moss-covered garden, appeared, and the arrow was stuck in the ground by the flower-bed.

5. The yellow color of the shaft suggested the yellow beak of a duck, with a spotted brown back, which stood in the air stiff and straight with its beak in the ground.

6. The color again suggested an onion, the onion bulb yellowish red, and the stem white, with the tail feathers of the duck changed into green leaves.

7. The onion led to a duster, with knobs like onion bulbs and the leaves turned to feathers.

8. My attention was drawn to the feather portion, while so far it had been drawn to the other end. The feathers now changed into green leaves and the handle into a red turnip.

Here I made an effort to return to the bow, hence the abrupt change in the images.

9. I wished to complete the arrow, and an abrupt change produced a sword.

10. A peculiar return to the onion at one point, and the development into an arrow of the remaining parts followed.

11. Thence to the arrow like the original, but placed perpendicularly.

12. I recalled then that I ought to produce a cross-bow, so I started with 11, and the flat form of a turnip followed.

13. Some lines on the round turnip suggested a Japanese mopping broom. I was surprised at this, and so made an effort to arrive at the cross-bow.

14. Then a die appeared, with rough sides, and indefinite points marked on the sides.

15. This rounded itself into a round wooden box with a rough brown surface.

16. This to a bamboo basket of bright yellow color.

17. Then a red brick, which, prolonging itself, developed into the stock of the cross-bow, and thence into something like the original cross-bow.

SERIES II AND III.

These images are the more pronounced and definite stages in the development of innumerable half-defined images. The images following 1, for instance, are all suggested by the lines of the window-panes,

but my mind seems to reject a number until it is satisfied with a more definite embodiment of the characteristic point. I do not understand the basis of selection, except that of definiteness of the whole image. What I have to guard against is the rising of images independent of the one before me, that rise as associations of the whole and not of the part. Thus a window, as 1, suggests another window of a little different kind, or a pumpkin suggests a watermelon. Throughout these changes the lines were the point of association. I gaze on one image until the mark of association fastens itself upon a definite form, when the details of the image, the color, etc., appear and complete it.

In some cases the center may remain the same, and the fringe constantly widen instead of changing, *e. g.*:

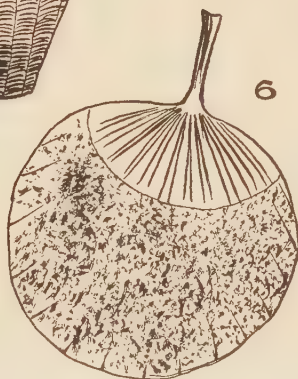
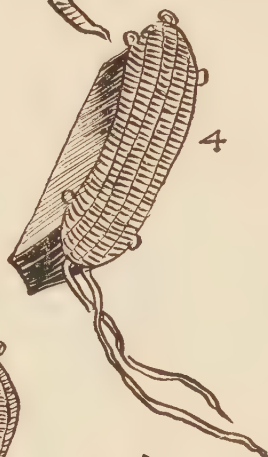
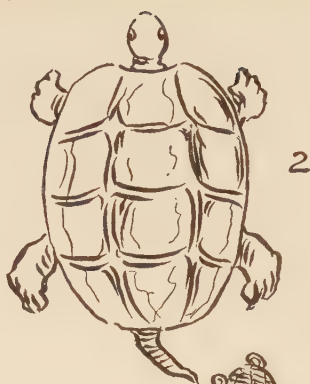
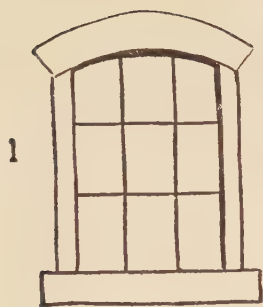
1. My tack-hammer.
2. My tack-hammer in my bag.
3. My tack-hammer in my bag in my closet.
4. The room is taken in; and so on.

The center of attention throughout is the same, but the extent of the image widens. This form is exceptional, because usually there is no object in widening the range unless attention is shifted, and then the center is changed, and the association becomes one of mere contiguity.

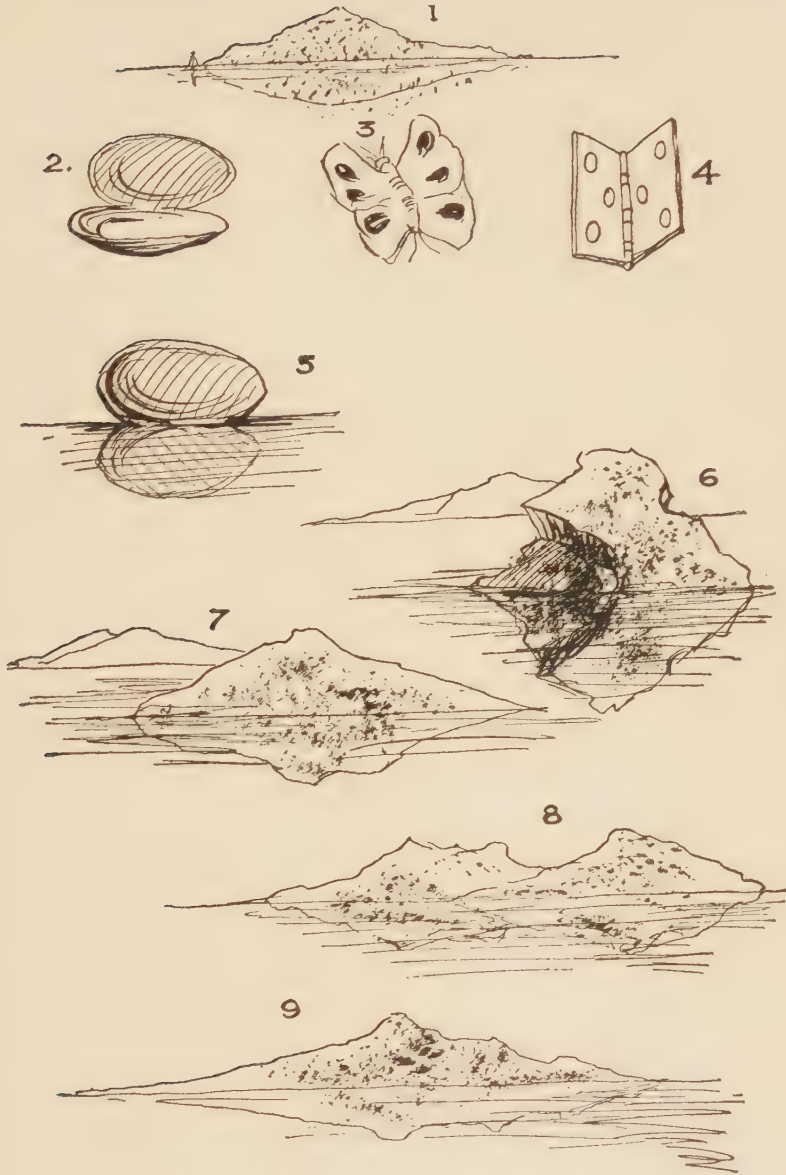
In securing all these series it must be remembered that the image which stood for the end was clearly defined, the prominent features of it were emphasized, and hence all incongruous images were unlikely to appear, and were promptly rejected when they did. The similar factor was emphasized as the end. Under these conditions, of course, the end being such an abstract one, the series are abstract also, and are not to be considered as illustrative of the theory that associations of external similarities are usual. They illustrate only the way in which attention works in the images. A series in a natural thought-process illustrates the point still better.

Thus my end is to state the theory of the trade winds. "Theory of the trade winds" is obtained from my outline. At once I have a visual image of a gray stream of wind passing from the upper right-hand part of a sphere to the lower left-hand part, and, accompanying this, the motor-speech image: "The cold wind coming from the north is deflected west by the rotation of the earth, and as it goes south gets

Series II.



Series III



warm and begins to sink." The visual image now changes to gray currents ascending and descending from a blackish cloud, and interfering with each other. The strife is the prominent thing, and the fact that I have no name for the rising current troubles me. Next come the words "warm air," with the visual image of the ascending current emphasized and the words "cold air is heavy." I stop to get my image clear. I have the visual image of the trade winds first described, but now at one point it begins to rise. I try to put descending currents into it, *i. e.*, to combine my first two images, but cannot get an image of them as coming in such a direction that they will constantly get cooler. My image stops short at the equator of the sphere; it consists of the half of the northern hemisphere that is towards me. I go back to this image, but the air flows south and gets warmer all the time; I go back to the rising currents, but they continue to rise.

I now state consciously to myself: "The air must be warm air getting cooler in order for it to fall. In that case where can it come from?" I get a visual image of a wind coming from the southern part of the northern hemisphere, but it does not agree with my first image, and I feel like rejecting it altogether. But I am sure that the air must be getting cool, and I cannot see where it can come from except the south, so I call it up more distinctly and follow it north to a connection with the first one. The first one gets this second as an addition, and at their point of junction I see a strife of gray currents which displaces the image of ascending and descending winds. This total image seems to grow smaller, and I see vaguely a parallel marked 35° , and a space extending south of it to the equator. The other side of the equator is a very vague image. My total image now is that of a hemisphere, with the northern half most distinct, and the center of clearest vision at a point about one-third of the distance from pole to equator, nearest the eastern side. On the northern half of this hemisphere are the gray currents sweeping southwest and northeast, and meeting and struggling at the center of the field of vision. This is so entirely satisfactory to me that I do not complete it by words.

As this series might not include all factors, since it deals with the physical world only, let us consider also the images in understanding part of the sixth chapter of Hegel's "Lesser Logic." The passage is

this: "In the dialectical stage, these finite characters or formulæ supersede themselves and pass into their opposites. (1) But when the dialectical principle is employed by the understanding separately and independently—especially as seen in its application to philosophical theories—dialectic becomes skepticism, in which the result that ensues from its action is presented as a mere negation. (2) It is customary to treat dialectic as an adventitious art, which for very wantonness introduces confusion and a mere semblance of contradiction into definite notions. And in that light the semblance is the nonentity, while the true reality is supposed to belong to the original data of the understanding. Often, indeed, dialectic is nothing more than a subjective see-saw of arguments pro and con, where the absence of sterling thought is disguised by the subtlety which gives birth to such arguments. But, in its true and proper character, dialectic is the very nature and essence of everything predicated by mere understanding—the law of things and of the finite as a whole. Dialectic is different from 'reflection.' In the first instance, reflection is that movement out beyond the isolated predicate of a thing which gives it some reference and brings out its relativity, while still in other respects leaving it its isolated validity. But by dialectic is meant the indwelling tendency outwards by which the one-sidedness and limitation of the predicates of understanding is seen in its true light and shown to be the negation of them. For anything to be finite is just to suppress itself and put itself aside. Thus understood, the dialectical principle constitutes the life and soul of scientific progress, the dynamic which alone gives immanent connection and necessity to the body of science; and, in a word, is seen to constitute the real and true, as opposed to the external, exaltation above the finite."

The first sentence calls up a vague image of Hegel's system.* Afterwards, the general procedure is to read a sentence, which usually gives no meaning at first, and then re-read, getting some kind of an image. At times a number of sentences or a whole paragraph has to be gone over two or three times before any meaning will be visible. In the re-reading I go slowly, referring from beginning to end and *vice versa*, constructing my image in view of these references. Thus in the second

* This image is a dim visual one of a black mass heaving up in one part and falling over into another mass. This stands for the three stages.

sentence I start with the image left over from the last, of the system, and get a series like this:



The words "separately and independently" lead to 2, the separation being also represented by motor images in my hands and a dissatisfied, uncertain feeling of "Where am I at?" But the word "skepticism" brings up the words "Kant's antinomies," with a vague motor image of something clapping about in the air and the words: "That is skepticism. The contradiction is not allowed to explain itself in reality."

In 2 the atmosphere of the first part seems to me Kantian. I cannot describe the reference more exactly. It is possible that there was a very vague visual image of the book I used in studying Kant, but this may be my own creation in reflection.

As nearly as I can tell, no images except motor-speech images rise until I get to the definition of reflection. The subject-matter is familiar and the words suffice. But the first sentence on reflection gives me no meaning, and I go back. I start with the black mass, from which an arm stretches out and wavers up and down as I get to the middle of the sentence "which gives it some reference." The image blurs, and I have tense feelings in my hands and chest. I start over again and repeat the words, with the same result. Then follow words: "What does 'it' refer to? Thing. Reflection is that movement beyond the isolated predicate of a thing which gives the thing some reference and brings out its relativity while still leaving it its isolated validity." The image does not come, and I impatiently begin again, repeating the words very slowly and building the image. First I substitute "predicate" for "it" and identify "it" with my black mass. Beginning with the black mass, I again get the wavering arm, but at the word "*reference*" I say, "It must be attached to something, then, and that is why it is *relative*," and the arm seems to connect itself vaguely with an indefinite airy something. "But that is judgment," and I have again the tense feelings and go over the image with the same result. Then it seems as if something breaks through. There is a quick drawing in

of my breath and tightening of the muscular tension, and the words: "Is reflection judgment? I believe he would identify the two, but he would hold the predicate as applicable only to the one thing and keep it abstracted in all other respects." The tension relaxes, and I go on.

"Dialectic" is represented by a sphere swelling outwards, but I have nothing to represent the "one-sidedness and limitation of the predicates." "Finitude" is the sphere pressing inwards, called up by "*suppress*." The rest of the paragraph is easy and calls up no visual images.

Now, of course, numerous other images also rose here and are rejected. In reaching the conclusion on reflection, numerous sub-images came up of the seminar and the beginning of a discussion on the point, and other images of discussions that we had last winter. Again, I have numerous images of various members of the seminar in characteristic attitudes, smiling over my difficulty in understanding the passage. This division of attention is due to the fact that I thought of reading this account, to them for criticism, and so the process had an emotional element usually lacking in abstract thought.

Still another illustration from algebra. As I think over positive and negative terms I have a mixed state in mind. First I have motor-word images like these: "What does the negative mean? Simply the taking away of one quantity from another. But how can you take away a quantity larger than what you have?" This is accompanied by very vague visual images: $-$, and x^3-4 , and with the last question an almost indescribable image arises. First come the words: "It is merely a mechanical device." Then comes a sense of nearness to some seventeenth-century man who first used the device, and a feeling of the impossibility of an explanation without some kind of reference to higher mathematics. These images are provokingly vague and fleeting. They are partly tactile, but too vague for me to describe. Next I have vague visual images of a pair of scales, a man's hand in his trousers' pockets, and a line running north and south. These are the three current explanations, and the second is the most prominent because I learned and taught it.

"If a man borrows—but he cannot borrow more than the other man has to lend. Suppose a man is worth five dollars and borrows eight. How much is he then worth? Evidently three dollars less

than nothing, and that can be written thus: $\$5 - \$8 = -\$3$. Now, suppose that the three dollars of debt is taken away from him, what will be his condition? He will be $\$3$ better off, *i. e.*: $-(-3) = +3$. Further, if he gets into debt for three dollars at two different times, he will be six dollars in debt: $-3 \times 2 = -6$. But if he does not get into debt those two times, he will be six dollars ahead: $-3 \times -2 = +6$. The rules for positive and negative signs may, therefore, be formulated thus ,” and I write them down. These motor and visual images are accompanied by various vague visual images of the money transferences between the men, and of myself teaching.

Another very interesting series of images rose in connection with square root. It was in part words, accompanied by this series of visual:

$$\begin{array}{l} \underline{4} x^2 a^4 ; \quad 4 \underline{x^2 a^4} ; \\ \underline{4} (\quad) ; \quad 4 (\underline{\quad}) . \end{array}$$

This means that I had a plan to follow, *viz.*, to treat,

1. Monominals whose coefficients were squares.
2. Monominals whose letters were squares.
3. Binominals whose coefficients were squares.
4. Binominals which were squares.

The images were definitely concrete, as shown above, the center of attention being indicated by the lining, and yet they certainly had the general meaning consisting of the half-formed and yet unspoken general statement given above. This illustrates very nicely the imagery of concepts.

In all these cases it is to be observed that we start with some image as end. In the picture series and those given with them the end is simple and clearly defined. There is, therefore, little opportunity for associations and sub-adaptations. The mind is, so to speak, confined at the beginning, and the result is that the feeling of strain is prominent, and the rejection of associations is emphasized. The image of the trade winds is limited, but is not clear at its focus, the strife of the winds, where there is plenty of room for sub-adaptations to enter, each one being for the time the center. In the Hegel, again, the only end is the understanding of the passage, the image being so vague and indefinite as hardly to deserve the name at the start. It is to be

observed here that while in the other case the image builds itself, in this one, the subject being new, I was obliged with labor to draw together my associations, and my rejection of some was slower and more conscious than in any other case. Because the proper associations came so slowly also, many incongruous ones rose to occupy my attention, and much of my energy was spent in holding them under the surface.

In these latter cases attention has as its end the completion of our knowledge; it is, therefore, focused upon the vague or incomplete portion of the image. At this point of the image the associations rise, and the element of friction or tension enters in the attempt to clear up the image by their means. In the picture series, on the other hand, the center is perfectly clear at the start, and hence the tension enters in finding new fringes for the one center.

In the Hegel we find the explanation for the possibility of so many pure word-images. As long as the idea for which the word or group of words stands is familiar, no image except the word-image need arise. The case is strictly analogous to any habitual act. We start off with voluntary attention, but, the sensations being familiar, attention lapses, excepting enough to give us the signal when any image unusual in the series occurs. Then at once an image rises, and the effort to define it becomes strenuous in proportion as the images are in unaccustomed relations. Here I must refer again to Mr. Stout's, "In war the weaker have always recourse to conquest." I would venture to say that if Mr. Stout had not warned us beforehand, most of us would not see the contradiction on first reading the sentence. The words and arrangement are familiar; there is nothing to fix our attention on the contradiction between "conquest" and "weaker," and we simply get the words. If we stop to think about it, we realize the contradiction when we get images. In my first statement of the trade winds, how many, aside from teachers of the subject, saw the falsity of this statement, "The cold air going south gets warmer and begins to sink," until they built up the image?

So far we are in agreement with current psychological theory as to the facts of attention. I wish now to carry this a step farther and to show that the loose images in our minds—our stock in trade, so to speak—were at first attached to other images in the relation of means

to end. By degrees, the rigidity of any given train of images was broken, the individual image became the center of a number of series, and hence arose the seeming chaos of the associations of aimless reverie, of dreams, etc.

It is to be noted, first, that in any association the form of the relation of means and end is retained, although the content may be malapropos. When the mind is relaxed it is like a puppy at play. The play retains the semblance of fight or of food-seeking, but anything will serve as the material to play with. To illustrate: "I was thinking about going home this summer, and of how I should pack the things that I intended to leave here. With this came:

"1. The image of some soap in one of my drawers, unfit to be packed because mice would eat into the box for it.

"2. Visual image of the drawer and its contents.

"3. Visual image of mice nibbling the soap. A background image of myself saying to some of my friends: 'They must have been pretty hungry to eat soap.' I was going to add a joke, but felt that it would be in bad taste. Then came very quickly a series of images of myself discussing various subjects and always making myself ridiculous. The mice were still the prominent image.

"4. A mixture of the images of rats and mice. I called my first image 'rats.' The name called up the visual image of a huge sewer rat, so that I changed the name of the first image to 'mice.'

"5. 'The rats and the mice they made such a trice' I repeat the rest of the rhyme and have a visual image of 'Wheeling his wife home in a wheelbarrow.'

"6. One of the English professors hearing a class. He asks some question on Anglo-Saxon compounds, such that I can answer 'wheelbarrow.'

"7. A condescending smile as he says: 'A good illustration of the fact that women run to more concrete ideas than men.' Numerous sub-images of imagery debates I have had on this subject with various people.

"8. Indignant inward protest by me, with the feeling that I must control its expression. Words: 'You are entirely mistaken. I thought of that because. . . .' I go back and follow the series of images, think suddenly that it would be an excellent series to describe, and get up to write it.

"Note now the constant assumption of one image as outcome and the growth around it of images which might be or have been means or cause to it. The first image comes up as part of the packing, but, being dwelt upon, it becomes the center of attention and is made definite as in the second and third images. But, at the same time, the sound 'rats' has built up the usual visual image which has the effect of calling up that word, and this image is different from the one before me. The two come into conflict, therefore, and I rename the first. From 5 to 6 the same building up of images as cause follows, and it is repeated with especial clearness in 7. Here the image most prominent is the word 'wheelbarrow.' To get the circumstances leading up to the word distinct, my mind posits inflections, etc., of the professor such as to make the form of a question to which the desired answer is 'wheelbarrow.'

"From 7 to 9 the series is based on a feeling of soreness that I had at the time as to my relations to people in general, and this also accounts for the sub-images in 3. I have the feeling that always accompanies a snubbing, and my mind instinctively builds up images conformable to it."

Here we see how the image is freed from its original connections, when, as frequently happens, the same image, or approximately the same, has been used in different connections, *i. e.*, for different ends, so that any one image, if we let the mind wander aimlessly, may call up incongruous images, or, if any two consecutive images are congruous, the first and third, second and fourth, etc., may not be. That is, there is a transference of images constantly going on. For instance, the other day a bill of \$2.45 was sent to me. As I looked at it hastily I said "2:45, lacks $\frac{1}{4}$ of 3," and went about all day thinking that it was a bill of \$2.75. The perception \$2.45 called up the time image, which is strong because I frequently take a train leaving at that time.

Such a case is not an association of similarity in the ordinary sense of that term. I did not associate \$2.45 with the time 2:45 because the number was the same in both. On the contrary, the relation of means to end came out very nicely. The meaning that I gave to the number was due to its relation to my catching a certain train, and to my consequent translation of it into my habitual time vocabulary. That is, the number 2:45 meant $\frac{1}{4}$ of 3 because I had used

it in that relation only. When the new experience came, I simply interpreted it by its most prominent sign in accordance with the usual meaning of the sign.

The factor of emotional tone is, theoretically, one of the most important elements in such associations, because it is the sign to the organism how to react. For this reason any one shade of emotional coloring has been used so many times in so many different connections that it may call up almost any image, although the general meaning of all is something good or bad for the organism.¹

Here, also, we find the explanation for the crossness or peevishness of ill-health and the overflowing kindness of good health. Stimuli are constantly going into the brain as signs for a certain reaction. The constant attempt of the mind is to build onto these a definite image in order to get a definite reaction, and in this attempt it will first take the usual thing as cause, and react accordingly. It is not until after reflection that the stimuli are referred to the bodily condition, for in the race-experience most stimuli come from outside, and so the tendency is to objectify all stimuli. Here too is the cause of hallucinations. If I have cutting sensations across my fingers and wrists, the image of a knife rises, and although in my waking hours I know that there is no knife, in sleep it becomes objectified. So, too, if I am parched with thirst I may imagine that a wolf has me by the throat, and so on. The following curious combination seems to be due largely to such associations:

"I saw the corner of my dining-table here at my boarding place, and on it a lemon, held by my left hand (motor), being cut by me with our carving-knife at home. The delicate yellow of the rind and the duller color of the pulp stood out distinctly. As the knife cut through the lemon, blood spurted up, and the lemon seemed changed into my wrist. The combination seemed to come about thus: We had had lemons in iced tea for lunch, and that gave me the original image. I was very tired and had had cutting sensations across my wrists, which are always intensified when I think of anything like a knife."

¹In this connection an article in the *American Journal of Psychology*, October, 1897, by Miss June Downey, is interesting. Twenty-two persons were asked to interpret six pieces of music with which most of them were not familiar. While the emotion aroused by a given piece was much the same with all the persons, the specific image varied almost according to the individual.

The curious objectifying of the cutting sensation into the knife is an illustration of the growth of hallucinations. The same thing appears in cases of melancholia and insane delusions, as evidenced by Ribot in his monograph, "Alterations of Personality." In such cases certain persistent stimuli are sent into the brain which in the past have served as a sign of certain objective conditions. They are, accordingly, interpreted in the same way now, and the mind thus builds up a seemingly rational explanation for them. Thus in certain forms of disease there is nausea, accompanied by pressure upon some nervous centers and by constriction of the lungs. All the sensations are those following fear, and hence the person, in defense of his own rationality, seeks an object of which to be afraid. It is certainly true that if, in such cases, the attention of the patient can be fixed upon the intra-organic origin of these sensations, he will not have the illusion, although the emotional tone may remain.

It appears, then, that the association is really due to the assumption of an identity between two factors. In so far we agree with Miss Calkin's discussion. But this identity is one of use, not of qualities, either external or emotional, nor of space and time conditions. In so-called associations of contiguity those features are associated in the memory which most aroused our interest in the experience, or which we react upon indiscriminately in the manner already described.

When, finally, we take any one image to watch, the workings of association and dissociation are shown again in an apparently automatic development of the image. I take arbitrarily the image of some small object as starting-point and hold my attention to it, not allowing my mind to wander as in reverie. After an interval the image begins to grow, and a series of transformations follows.

For instance, I started with the image of a delicate green string-ball, with a deeper green ribbon from which it hung, and a piece of string coming out at the bottom. After some time the ruffle at the top expanded and turned down and around the ball into a hood, the ball becoming a baby's pink and white face. I recalled the original image, and it became an orange, and then the back view of a green coal-scuttle bonnet on an old lady I used to know.

Again, I start with the image of a bottle of Sanford's ink, the yellow label being the conspicuous part. The label becomes a clown's

yellow and pink face, which turns so as to look up and out of the corner of its eye at me, while the figure is bending over its yellow shoe. The crescent moon, with a peaked face in the crescent, then appears, and then the face retires and leaves the crescent moon moving through clouds. And so I can let the changes go on indefinitely.

In another case I took as image a black rosary, which stood out against the wall. The results were as follows: First it narrowed to a necklace upon a lady's neck. I recalled the original, and it became a bracelet on a hand. After the return it appeared around a monk's waist. Then it spread around a chair-top; and finally, after the last return, a hand came out from the wall and held up the rosary. I did not notice during the series that the rosary had nothing to support it, so that I was not consciously seeking a cause.

The noticeable thing in all cases is that there seems to be within the image itself an element of growth which must be given play in order to hold the image. This is simply a restatement of the fact that we cannot attend to one thing continuously, but, as the statement is usually made, there is an implication of an effort at construction in the change. The point that I would emphasize, on the contrary, is that the change is involuntary quite as much as is the retaining of identical elements in associations of similarity, and that this is especially well shown here because I am trying to attend to but one thing. From another point of view, it is a statement of the fact that all consciousness is motor.

If I let my mind wander where it lists, both factors of fixity and change come out more prominently, the changes are apparently more abrupt, and are more fitly termed series of images than the growth of one image. If, however, one takes any one of the series to watch, it also develops as in the cases described above, so that all consciousness may be looked upon as the continual budding and sprouting of a plant, which is not usually observable in detail, but comes out clearly when a period of growth has effected noticeable changes in structure.

The discussion may be summarized as follows: We cannot, to begin with, get back of the impulse to self-preservation and of its primary expression in the tendency to retain or to maintain the organism in *statu quo*, commonly known as the law of inertia in physics, or as habit in biology. This assumed, in the course of evolution those

animals have survived which possessed the greatest power (1) of indiscriminate reaction and (2) of limitation of this reaction and of objectifying, *i. e.*, imaging it, when interrupted, as a desirable end. The line of development was, therefore, this : no image ever arose *per se*; it always developed either as an end or as a means to some supposed beneficial activity. When an image had once developed, however, it proved serviceable in other relations than the one in which it originated. It then became prominent through being the one permanent factor in a number of transitory processes and ends, and was isolated as material of the mind, instead of being considered as a center with an infinite number of functional connections with other centers. In this way the stock of images on hand was constantly enriched, and the variety of possible choices for any one end was constantly increased.

As a result, when there is any especial end in view, the mind can select from its stock the image which rises as most suitable to that end, and when no end is in view, any image that rises will call up habitually associated images, or images in which the transference above mentioned has been effected. In either case, the tendency is to give them the external form of means and end, according to habit. This is shown in play.

This theory at once gives a vantage-ground for criticising the usual division of associations into contiguity, similarity, and contrast, and for criticising the conditions of habit, recency, vividness, and emotional congruity as used for explaining the particular associations in any case.

As generally used, contiguity is, formally, association of objects by their time and space relations, the particular images which rise being dependent on the conditions named above. Actually, of course, all associations must have this element, and hence contiguity has been a catch-all for associations in which no striking similarity or contrast was visible. From our point of view, however, we have seen how this habit of indiscriminate association grew up, and hence we can understand both its unimportance and its value. We lapse into associations of mere contiguity in proportion as our stimuli have no especial interest, are not bound together towards some end, or as we are unable to get the desired means to our end.

Associations of similarity and of contrast *per se* must be denied. They now appear as pieces of patchwork, made by picking out here and

there, without regard to their actual order, certain factors which have similar or contrasting qualities. As a matter of fact, the mind is just such a rag-tag-and-bobtail kind of thing as that. No series of images ever actually follows similarity alone, unless some abstract quality is itself the end, and this seldom happens. The mind does not dress itself in whole suits. It has had, in its development, to use for the most varying purposes the material it had at hand, in order to protect itself at all from the encroachments of its environment, and the result is seen in the conglomerates of images discoverable in any train of thought. In other words, eye, ear, and all the special senses have always coöperated to bring about muscular reactions; the ones that had superfluous energy supplementing the others without regard to external likenesses. The only similarity which the mind uses is that of end. In so far as like objective qualities imply usually serviceableness for one end, we now take this implication for granted and associate them. This, of course, is frequently the case, but that the external likeness is an accidental thing is clearly proved by the cases where there is unlikeness, but yet serviceableness for one end.

We must, in reality, reverse the ordinary standpoint, and instead of considering ideas or images as entities with like or unlike qualities corresponding to objective things, which likeness or unlikeness is a cause for connection, we must look upon them as growing out of a shapeless whole, just as the parts of the body are differentiated from one shapeless cell. We are still full of the associationist psychology in our habits of dealing with our mental data, although we have formally discarded it.

This comes out again in our use of the conditions of habit, recency, vividness, and emotional congruity. Practically, here we are reduced to going in a circle. We can find contiguity, likenesses, and differences in any objects under the sun. No two things can possibly be mentioned that have not all these relations in thought. Hence, when we come to follow out series in our own minds, we have no explanation for their order, and we have posited these conditions as an explanation.

In using them, our method of procedure is something like this: First, we invoke habit. Out of the vast number of similar or unlike images, those two occur together which have most often been experienced together. When we find that this does not happen, we declare

that the impression must have been recent. When this does not serve us, we call in emotional congruity, and when that also fails us, we can always revert to vividness, and, reasoning *a posteriori*, maintain that the impression must have been a very vivid one or else it could not have endured so long. We have here, in short, the very puzzling question of whether there is any law of precedence in these conditions. None is usually given. Recency may, in one case, lead to rejection of all the others; in another, habit may; and so with all. We are in as much uncertainty as we were when we started. We get into the same difficulty when, finally, we invoke interest as the one supreme law. Is an image vivid, habitual, and emotionally congruous because it is interesting, or is it interesting because it is vivid, habitual, or emotionally congruous with our mood? The plan is worked both ways according to the demands of the time, and both ways seem to be true, so that we are again in a vicious circle.

The difficulty is the same throughout, viz., that we do not examine the origin of these conditions. Our description is a purely surface one and is bound to be more or less irrational. Taking these conditions, habit and vividness are certainly directly referable to interest. The stimuli in which we are interested are the ones, and the only ones, which are vivid to us. Further, those in which we are interested are the only ones which stand any show of being retained. Even in associations of contiguity, in the original experience only those factors will enter which to some degree attract and interest, and in the represented experience they will be vivid in proportion as interest leads us to linger over them. In all association we associate the factors in which we are interested.

At the same time, this explanation is not satisfactory, for all interesting factors are not associated with all other interesting factors, and the same ones are not invariably associated. We are, accordingly, forced back into a study of the origin of interest. This is itself material for another thesis, and I can here do nothing but make assumptions. In its origin, interest is identical with the impulse to self-preservation, including in this self-development, and the particular interests or objects in which we are interested are what we conceive as useful in satisfying this impulse. Interest is, then, simply a name for the motive power or feeling side of consciousness when it has become defined by

some image functioning as end, and we classify and name interests by the end.

The image as end originated, as we saw, in the tension or strain rising when an old or habitual activity is interrupted, resulting in the objectifying of the old activity as end and a modifying of it by present conditions. In this process, some activities are more prominently pushed out into consciousness as serviceable, and they are the ones that rise when the end is reproduced. Whether they are vivid, similar, contrasting, contiguous, or emotionally congruous depends entirely upon the nature of the end. The one constant factor is that we conceive them as the most closely bound up with the end.

We have, then, two mental attitudes. In the one there is an end clearly before the mind, which chooses and rejects the images which rise as possible means. It follows a path. The images rejected frequently hardly even get before the mind. They are nipped in the bud. The images chosen are also strictly curtailed by their function as means to the end. One quality may be allowed to develop, but others are bound closely, and the tendency is to reduce them all to mere cues or signs that we are going along the right road. This abbreviation may be carried out to a very great degree as habit increases. It is particularly great in thought, in which conceptions are used, for while, in forming concepts, a great variety of images is necessary, this variety itself is confusing and leads to the substitution of a sign or symbol. In this attitude the mind is girded up for the race. Everything superfluous is cast off. The one test for the universe is: "Will you serve my end?"

When images do serve, it may be either because they have similar qualities, either objective or emotional, or because they are contrasted in nature. The first case rises particularly when we wish to widen our range of action along old lines. It comes out as synthesis or induction in the purely theoretical sphere. After some repetitions of these associations of similarity, we generalize our experiences, reverse the original conditions, and interpret the similarity as meaning that the experience will serve one end. Thus if two experiences are pleasurable, the assumption is that they are congruous for one end. Only sad experience teaches us that a Thanksgiving dinner and intellectual pleasures cannot coexist, and that the delight of boundless hero-worship must die if compelled to live with the joy of an analytic study of

our fellow-men. Experience is constantly forcing us back to the idea of end as the principle of association, instead of to that of similarity.

When, on the other hand, instead of widening our activity, we wish to define it clearly, to mark its limits; when the limits are still uncertain, contrasting images arise and are emphasized above the similar ones. The whole process of deliberation or of doubt, the case of mixed emotions, the framing of a hypothesis, all enter here.

Vividness contains an ambiguity. As a usual thing, only those impressions are vivid to which we attend, *i. e.*, which we conceive as useful. But we say that a strong stimulus catches our involuntary attention and makes a vivid impression. This case falls easily under the law of indiscriminate association. If the stimulus holds our involuntary attention, it is because we associate it with some end useful to us, and then it falls under our general law.

In the second attitude the mind is relaxed. No new end is explicitly before it to mold its activity, and hence any image may develop along almost any line. This line will be that of habit modified by the present interest, *i. e.*, the present end.

Here the empirical classification by similarity and contrast finds its strong point in a study of the series actually observed. In any one series similarity, contrast, and contiguity may all be found, but the fact that all occur indiscriminately proves too much, for it shows that probably the occurrence of each is controlled by a higher law. Many times the association is superficial, such as that between squeaky shoes and a squeaky hand-organ; in other cases, like that between Daniel Deronda and Michael Angelo's David, it is obscure, and in still others it is grotesque or bizarre. All these cases, however, can be understood if we conceive the image as the focus in which many ends meet. Unless there were a similar reaction, squeaky shoes would not associate themselves with a hand-organ, and the same is true of Deronda and the David. In some cases, doubtless, we are now unable to trace the associations back to their source, and for that reason it is not assumed that this theory is *demonstrated*. What is maintained is that it furnishes a logical hypothesis for the further investigation of mental development.

The theory also marks both the limitations and the truth of the opposing claims made by James and Baldwin. The difference between

the two is, in brief, this: James, with that fine appreciation of the mobility and freshness of our mental life that characterizes all his work, finds it impossible to account for men of genius on any theory that makes ideals and inventions the result of habit. There is too great a difference between the humdrum monotony of the average mind and the brilliant coruscations of genius for such a theory to be reasonable. Great ideas, great inventions, are the results of "lucky accidental variations," of a "fortunate tipping of the brain," of some inner brain change which cannot be foreseen.

Baldwin, on the other hand, seeks a statement of the process of knowledge in his theory of attention levels. He notes, to begin with, against James, that when we want to do original work we do not scatter our attention so as to admit as many lucky variations as possible, but concentrate it about the problem in hand. He then traces the course which we follow in this concentration and the conditions under which any idea is admitted to our attention. These conditions are essentially those of habit.¹ If, when any stimulus, extra- or intra-organic, muscular or ideational, is sent in to us, it is in agreement with certain gross habits of reaction—our interests and familiarities—accommodation along those general lines follows. This gives the feeling of vague familiarity and results in a narrower accommodation which identifies the object with a certain class. Then, again, another and finer accommodation identifies the object itself.

Here the whole process of selective thinking depends upon habit. "Apprehension of a new truth is always either the consciousness of an identity, in which case it is treated as an old truth in all respects, or it is in some measure subsumed under an old truth and so illustrates class-recognition. . . . Any new knowledge must be capable of the sort of subsumption which class recognition is." The accommodations serves as successive tests of the object. Nothing new can ever get into consciousness, no matter how small a thing it is.

Now, when this statement is examined, it means, apparently, two things. It seems to be simply another form of the statement that our knowledge-complex is made up of combinations and recombinations of factors which all take the form of sense-stimuli. In this sense, the

¹His use of "habit" covers both instinct and habit in the usual meaning of the term.

most abstract piece of new information appeals to the ear or to the eye or some bodily organ, and has, therefore, the most general form of accommodation at least. Everything, therefore, becomes a candidate for selection, just as in the other theories, and we are not a step ahead of the point from which we started. I do not see how the theory can be applied in any intelligible way except on this interpretation.

In the second place, there must be an instinctive response of the sense-organs to classes of stimuli. This is, of course, at once granted. I mention it here simply to bring out the further fact that if, when Baldwin says a new truth must be subsumed under an old one in order to be apprehended, he does not agree to this interpretation, he is forced back to the assumption of some preëstablished harmony between stimuli and the *mind*, or to the existence of innate or instinctive *ideas* in the mind waiting to be called into action by appropriate stimuli.

That is, his dilemma is this: As long as new knowledge is *new* it cannot be subsumed under *old* habits. On his theory the mind would accommodate to the old parts of an experience and leave the new untouched, and the possibility of any knowledge at all is dependent upon the existence of innate ideas. The process of knowledge and the discovery of truth consist essentially in getting such accommodations fastened on to such stimuli that the mind will thereby preserve itself. The mind never really learns anything. It simply recognizes and reacts; and when one reaction hurts, it tries another. The misfit, however, is an exceptional and inexplicable thing.

Or, on the other hand, if this element of familiarity is just the assimilation through the senses of all material for knowledge, the question assumes this form: Any stimulus is old in that it has the character of calling out the general accommodation of some sense-organ, and this doubtless furnishes the leverage. But every stimulus also requires a different accommodation from that sense-organ, either because the stimulus is one never before experienced, or because the condition of the organ is different from any previous condition. The point of interest is, then, this: Why are these new stimuli attended to, and how are new combinations formed in the mind between existing ideas or old stimuli? Baldwin explains the former as due to an excess discharge, and the latter as an accidental selection, out of the excess movements, of those which afterwards prove useful; thus, in

reality, coming back to the *deus ex machina*-accident, which he so abhors. Why there should be an *excess* discharge is itself inexplicable, since, in his initial assumptions, he makes no allowance for any reactions except those to which the organism is accommodated at birth.

James, on the other hand, emphasizes the importance of the new and of the reaction of the individual. Space and time forms are, indeed, impressed from without, but the other aspects under which we view the world pretty constantly now, such as causality, necessity, resemblance, difference, etc., are mental products. They arose by a spontaneous variation or lucky accident, and, having once risen, were found to fit the external world and were retained. In just the same spontaneous manner the invention, the poetry, the wit of the genius arise, and also the ravings of the madman and the fancies of the idle dreamer. The only difference is that in the one case they do not fit the surroundings and in the other they do.

This spontaneous variation cannot be explained by reference to the environment. The differences in members of the same family, for instance, are too great for this hypothesis to stand against. Neither are they referable to serviceableness, for in that case we should never have had the geniuses of music and art. All that we can say about them is that they are due to some inner molecular change in brain structure that, as far as our knowledge goes, is uncaused, is accidental. James does not say that they are uncaused in any ultimate sense, but only in any definite, intelligible one.

Now, it seems to me that a reconsideration of these points in the light of the theory here formulated will explain the facts cited on both sides. In the first place, it must be said that the origin of the æsthetic sense is at least dubious. The songs of birds and the cries of animals are directly serviceable in the maintenance of the species. Language or vocal utterance in man had the same value. Now, suppose that art and music, as such, were the result of primeval man's weariness of inactivity in the periods when food was plentiful and life luxurious. To primeval man were not they, too, directly serviceable because they gave his unused muscles the relief of exercise? This need of exercise was the direct result of the habit cultivated by the primary demand of the organism for food. When the demand ceased temporarily, the habit of muscular activity remained, and, according to the law of

mental action, the mind built up images to explain the craving of the body. Hence the primeval man probably sometimes hunted when he did not need food. When the weather prevented that, or when his bodily vigor was not great enough, he would imitate the hunt in the dance or in his drawings or story-telling.

The differences between members of the same family are doubtless due in part to hereditary circumstances which we cannot explain as yet. If James chooses to say that they are due to "accidental variations" in the Darwinian sense of that term, we can only cite the germ-plasm theory for the opposite point of view and confess our ignorance of the whole matter. This point is not, however, relevant to the discussion. Our question is simply: Given a person with certain tendencies to reaction, need we assume accidental variations to explain his individual development? Here the psychological difference between James and Baldwin enters. Baldwin, in his zeal for rationality and method, neglects many of the concrete data of our mental life in order to express it in his formula. After reading him one realizes that life *is* "a demnition grind." James, in a delightfully human way, takes the concrete facts and escapes the grind—and also the explanation.

The process in the comprehension of any knowledge, the solution of any problem, the invention of anything, or the creation of any work of art, seems actually to be something like this: There is at first a vague state of consciousness, which takes the form of a feeling of lack or of satisfaction, and which constantly tends to be objectified as an image to be avoided or realized. This objectification may be delayed through repeated failure of the vague first movements to secure an adjustment. When it is objectified, the feeling still survives as the impulse or instinct of which the image is the interpretation.

When the first vague image is secured, selection, with it as a standard, begins. First those images are chosen which are judged from past experience to be the most serviceable in reaching this end. The association-dissociation process here finds its completest function, and it is heightened into attention because there is the constant reference to the one image as end. As these first images prove to be unsuccessful, the reaction extends over a wider range and includes factors at first rejected, and at last, if failure still follows, the mind

may go into a spasmodic reaction, or a state of indiscriminate association, in which all possible paths are followed up in the despairing effort to strike the right combination. The case is illustrated by a person hunting for a lost object. At first he looks in places where he would be likely to leave it; then in less likely; and at last he will get into a condition in which he will look anywhere, however unlikely it is that the object will be there.

It is this constant extension of range in case of failure that Baldwin fails to recognize, and the results of which James calls due to lucky accident. James does not, on the other hand, give sufficient credit to the dominance of an idea, to the power of an idea to fix itself in the mind. We must admit—any student or any enthusiast must admit—that when some fundamental need of his nature has found form in an image, that image becomes the center of attention of his whole world. There are weeks and months and years when the external world of things and people is dim in comparison with this image, and when the whole content of the man's consciousness is selected with reference to it. In such a condition of mind, combinations will be formed which to the onlooker seem accidental, but which are so only to the onlooker. That an apple happened to fall before Newton at a given time was perhaps accidental—a nut or a book would have served his turn as well; but it was not accidental that the particular stimulus which he received was at once related to the problem on which he was working.

When the solution of the problem is thus extended over a long period of time, there is this condition of what, for lack of a better name, I have called indiscriminate association. All stimuli are examined with reference to the one end, and all the mental content is gone over with reference to it. The mind, not knowing where the decisive factor is to come from, strives to be keenly sensitive at all points, but at once abandons any stimulus which it has found unsatisfactory. Thus it happens that the man of genius is so extremely observing on some points and on others so provokingly obtuse.

The law of mental development may be stated thus, then: In development the mind has proceeded from the vague, indefinite reaction to the definite, limited reaction; in matured activity it begins, according to the law of economy, with the definite, limited, most

habitual image and reaction, and proceeds to the indefinite and indiscriminate. When the indiscriminate reaction succeeds, the same process of definition and limitation of it follows as was described under the head of mental development. When it does not, it is continued until exhaustion or acknowledgment of failure results, and constitutes a problem for future solution.

